



Congreso Nacional del Medio Ambiente

CUMBRE DEL DESARROLLO SOSTENIBLE

Germán Bastida

Fundación Nueva Cultura del Agua

Barcelona, 2 de febrero de 2006



**Agència Catalana
de l'Aigua**

Jornada sobre Ecoingeniería



Barcelona, 2 de febrero de 2006



Agència Catalana
de l'Aigua

Jornada sobre Ecoingeniería

Fronteras de la Ecoingeniería en ámbito ribereño

Germán Bastida



Qué es la Ecoingeniería?

Fluvial Processes
in Geomorphology

Luna B. Leopold

M. Gordon Wolman

FRACTAL RIVER BASINS
Chance and Self-Organization

IGNACIO RODRÍGUEZ-ITURBE & ANDREA RINALDO

Resilience and
the Behavior of
Large-Scale Systems

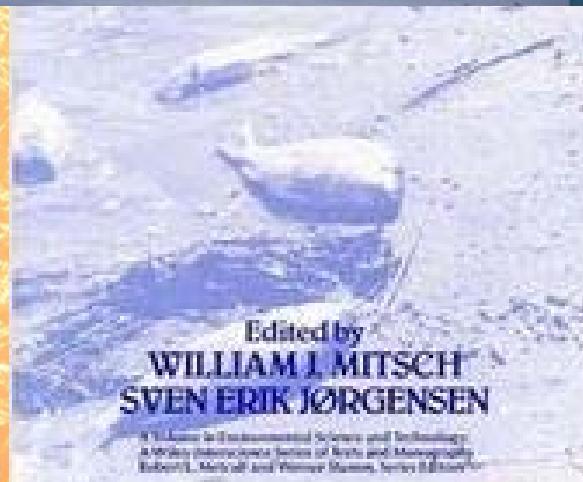
Flow of the River

LUNA B. LEOPOLD

Stream
Ecology
Structure
and
function
of
running
waters
J. David Allan

Kluwer Academic Publishers

**Simbiosis entre tecnología
y autoorganización ecológica**



Reconstrucción de ecosistemas

Materiales:

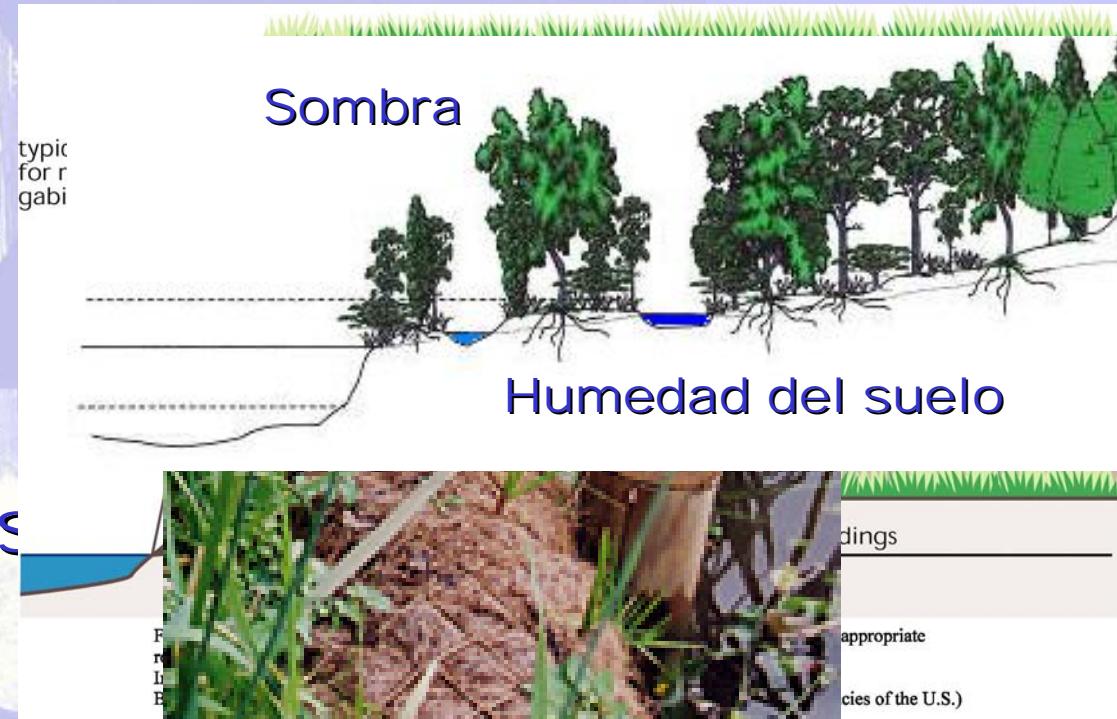
Topografía

Microclimas

Soporte

Fertilidad

Plantas



Revegetación

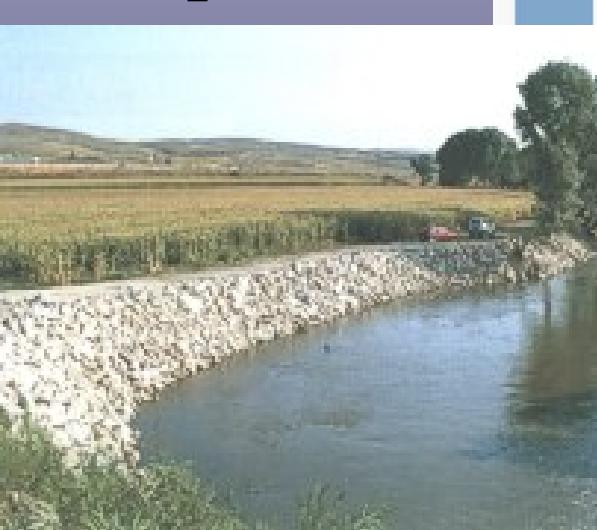


Las cosas por su nombre

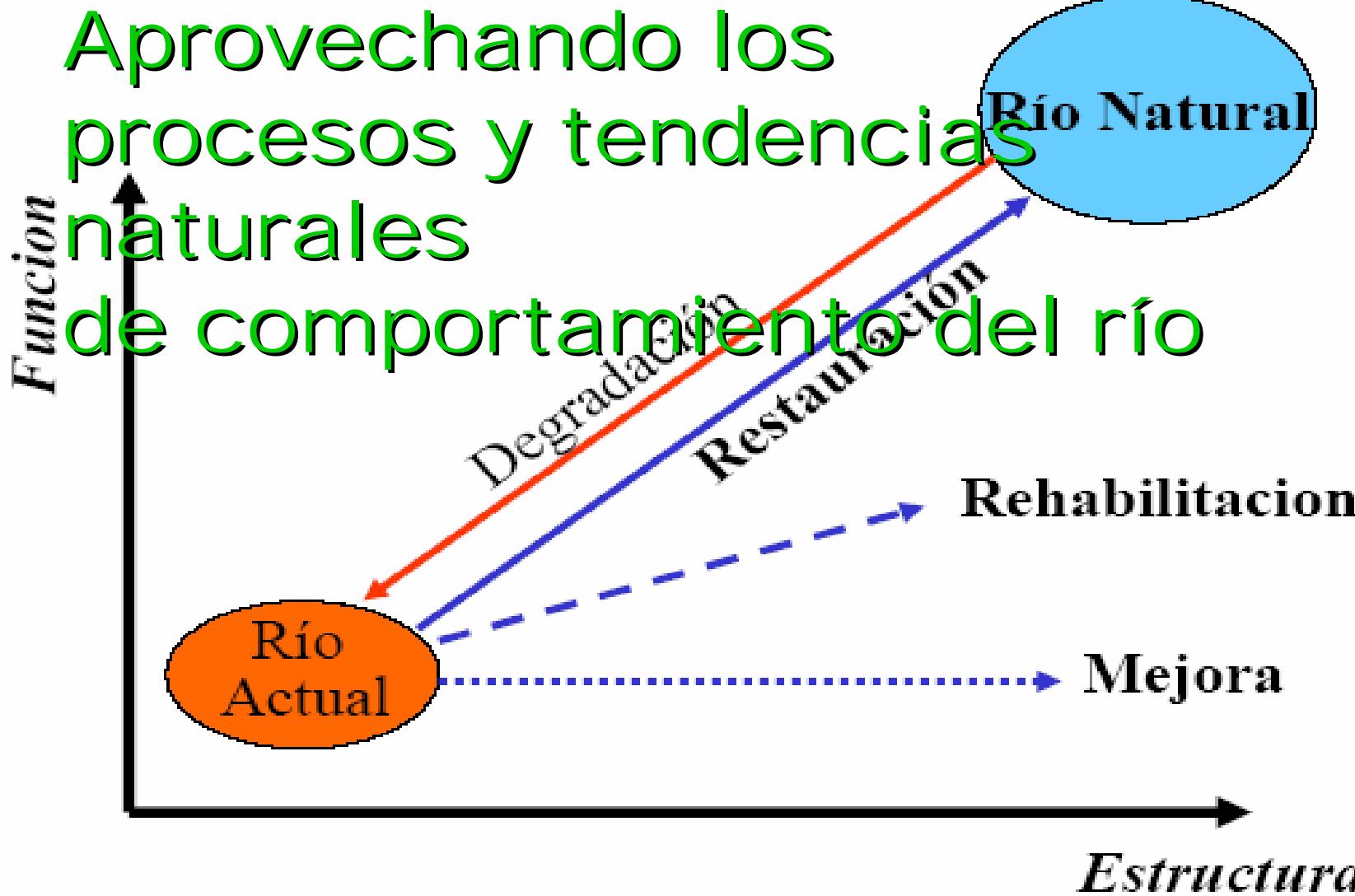


Agència Catalana
de l'Aigua

“Existe un conjunto de obras o actuaciones en el ámbito fluvial y acuático en general que, bajo la etiqueta de obras de mejora ambiental, tienen obvias carencias en lo referente al respeto y mantenimiento del estado ecológico, muchas veces en el estado de calidad del bosque de ribera o de su naturalidad, y que evidentemente es preciso corregir”



Las cosas por su nombre





Es el momento

2003 - 2004



Stockholm International Water Institute

Stockholm Water Prize

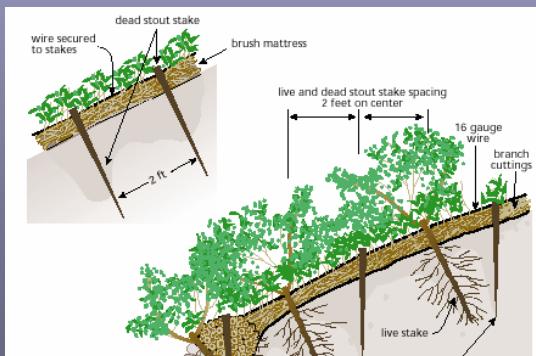


William J.
Mitsch
and
Sven Erik
Jørgensen



ECOLOGICAL ENGINEERING and ECOSYSTEM RESTORATION

Conradh



*Water quality
in the European Union*



Tres mandatos distintos

A faint, abstract background graphic consisting of a blue and green pixelated ribbon or wave pattern that loops across the slide.

Ecology

Buen estado de los biomas acuáticos (2015)

MANDATOS, NO OPCIONES

A faint, abstract background graphic consisting of a blue and green pixelated ribbon or wave pattern that loops across the slide.

Economy

Recuperación íntegra de costes (2010)

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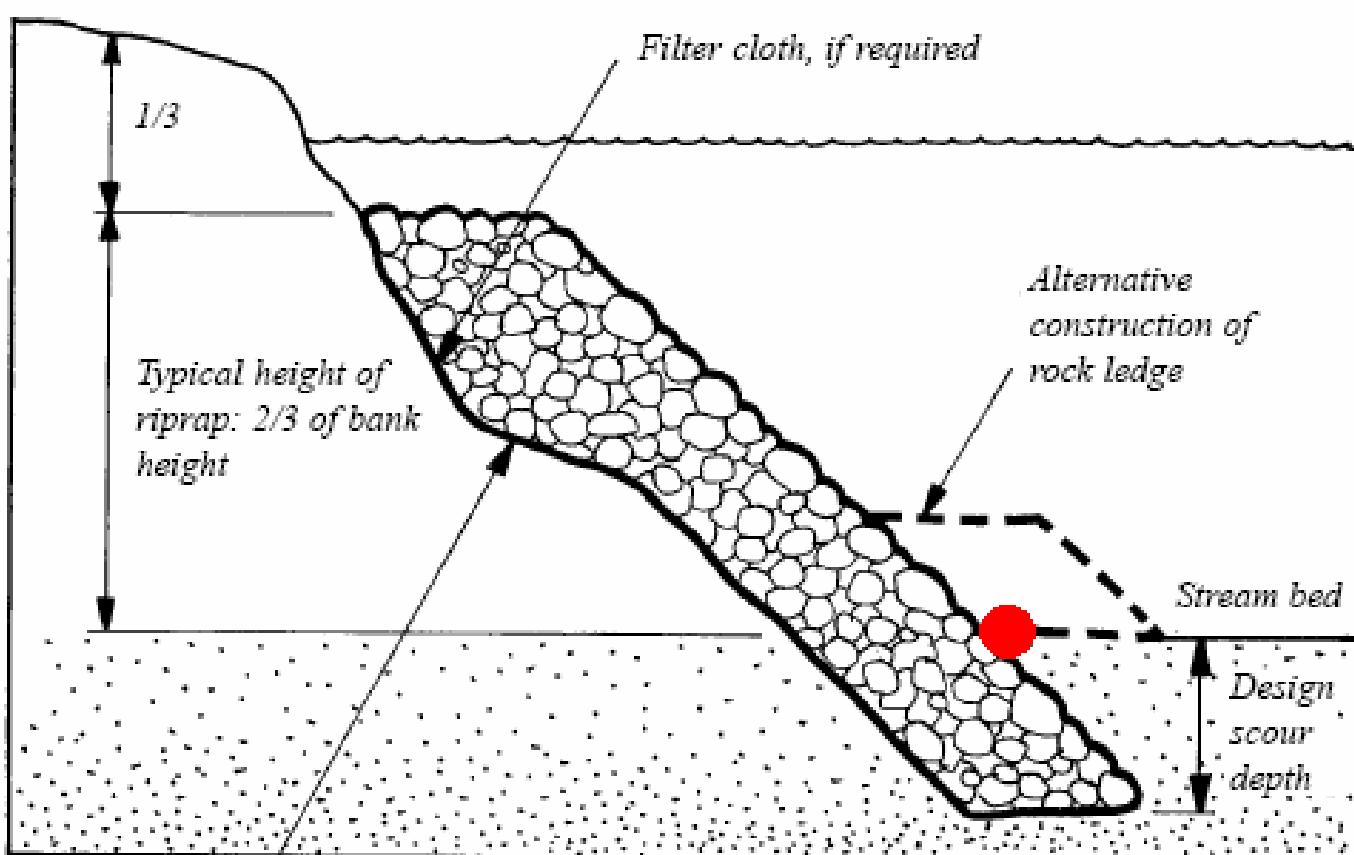
Equity

Participación pública activa (2008)

Preparando el renacer



Escolleras no, por favor



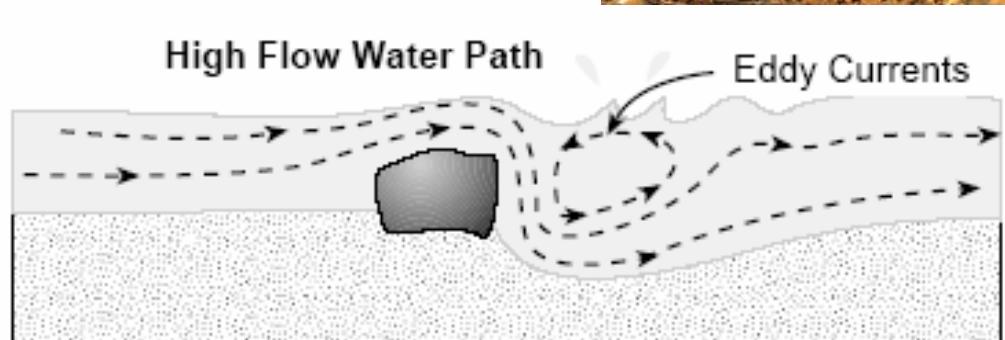
ación de
irse con



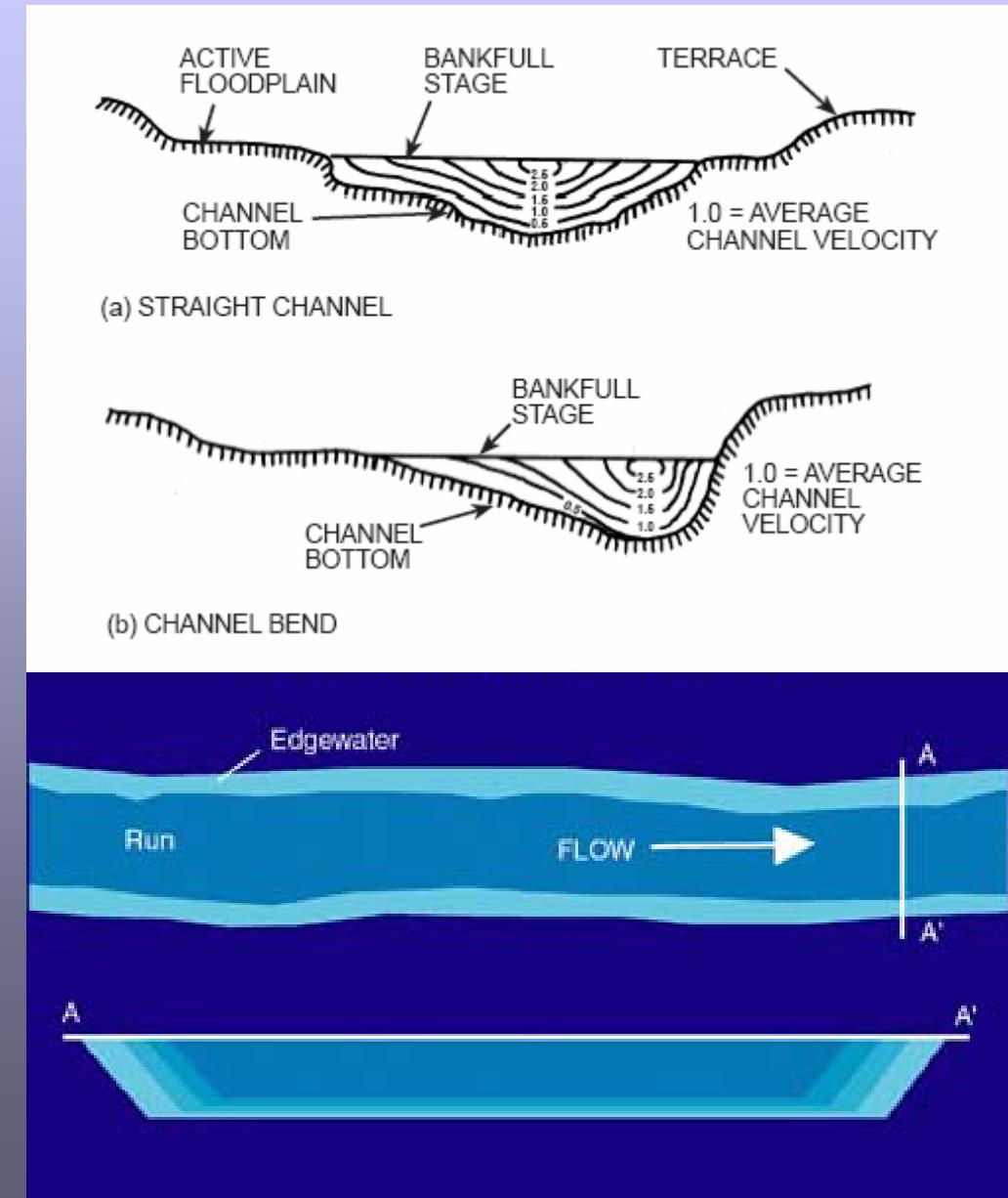
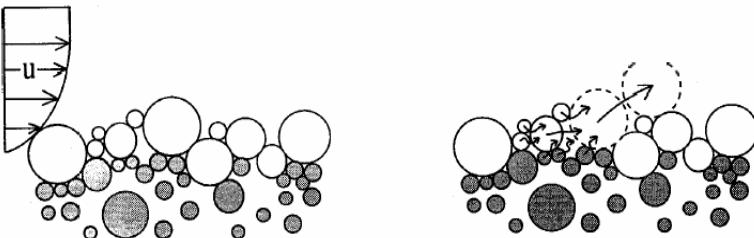
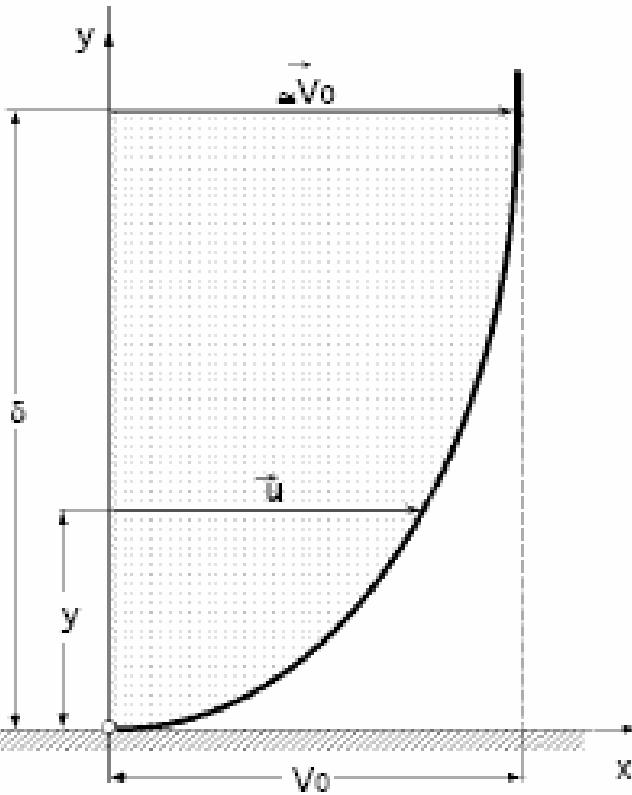
*Battering may be required
before placing riprap*

High Flow Water Path

Eddy Currents



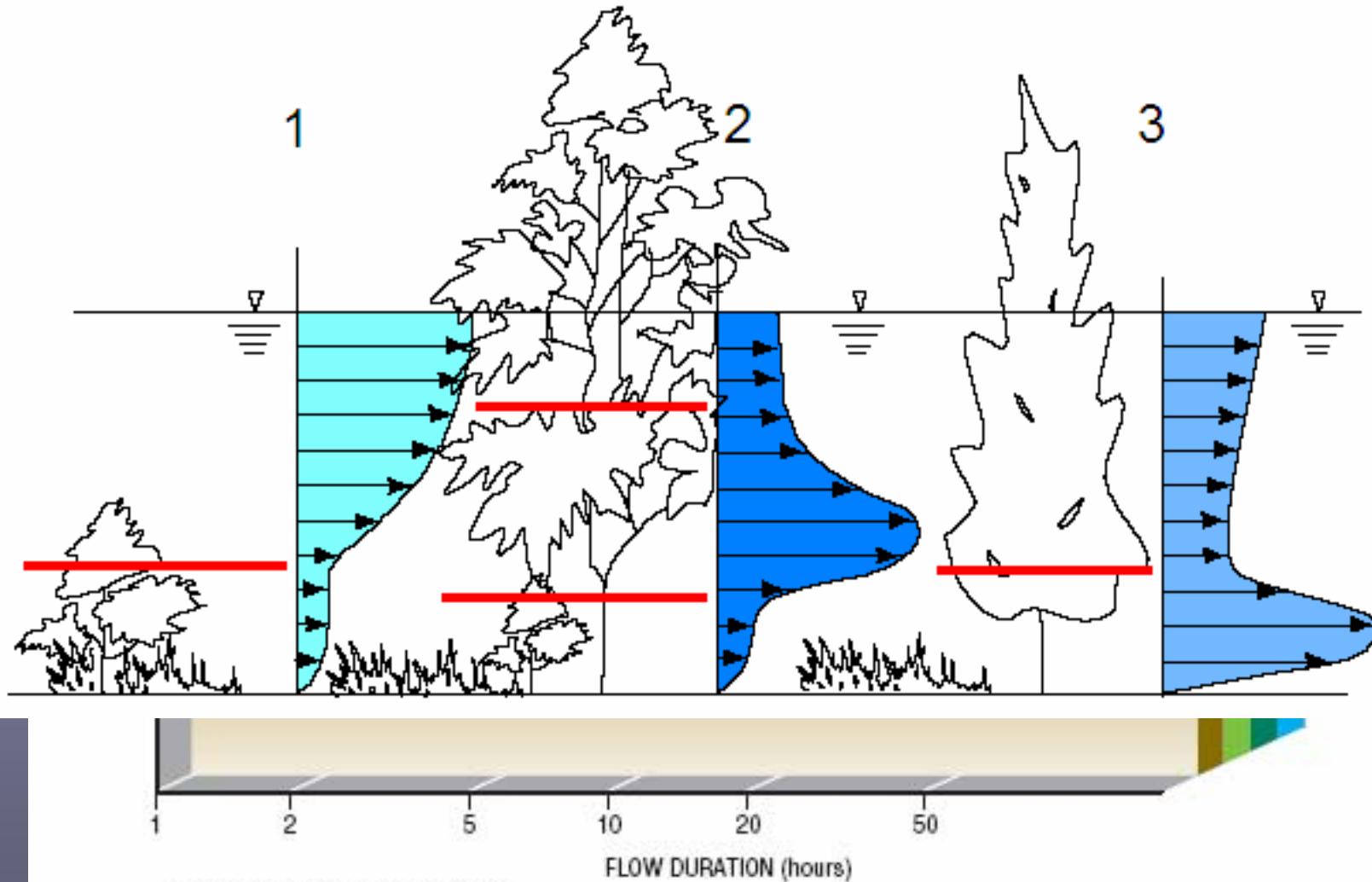
... ¿Y la velocidad?



... ¿Y la velocidad?

Fischelich, C., (2000). "Resistance Due to Vegetation," *EMRRP Technical Notes Collection* (ERDC TN-EMRRP-SR-07), U.S. Army Engineer Research and Development Center, Vicksburg, MS, www.wes.army.mil/el/emrrp

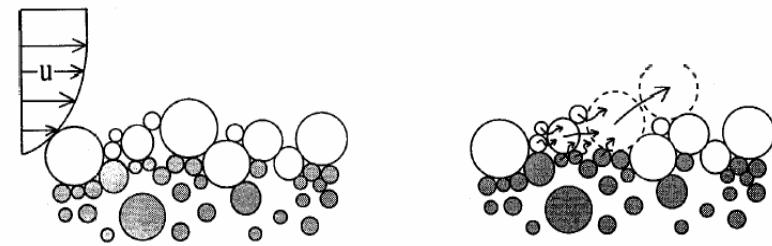
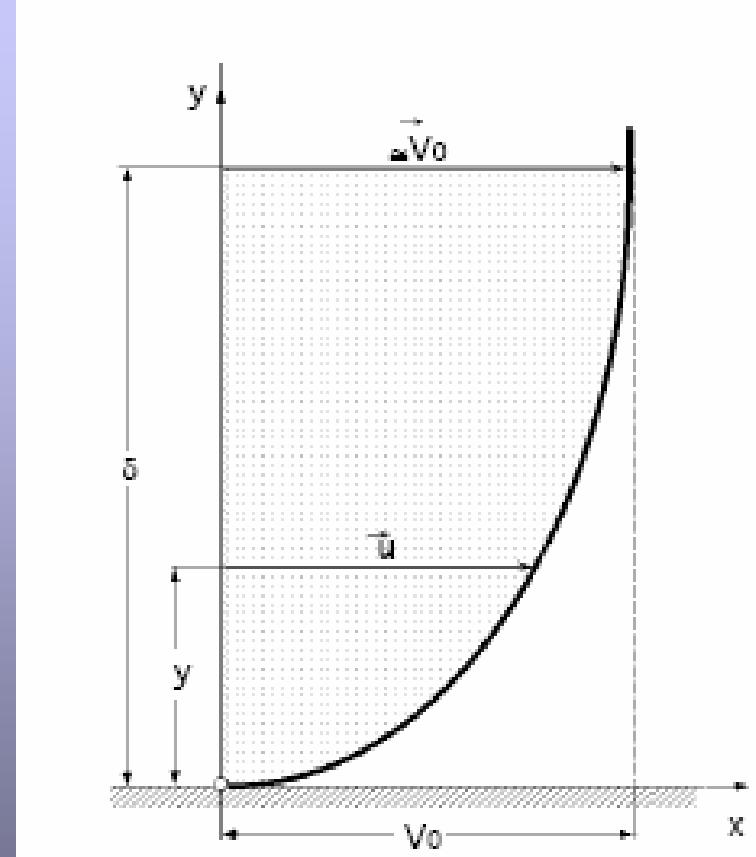
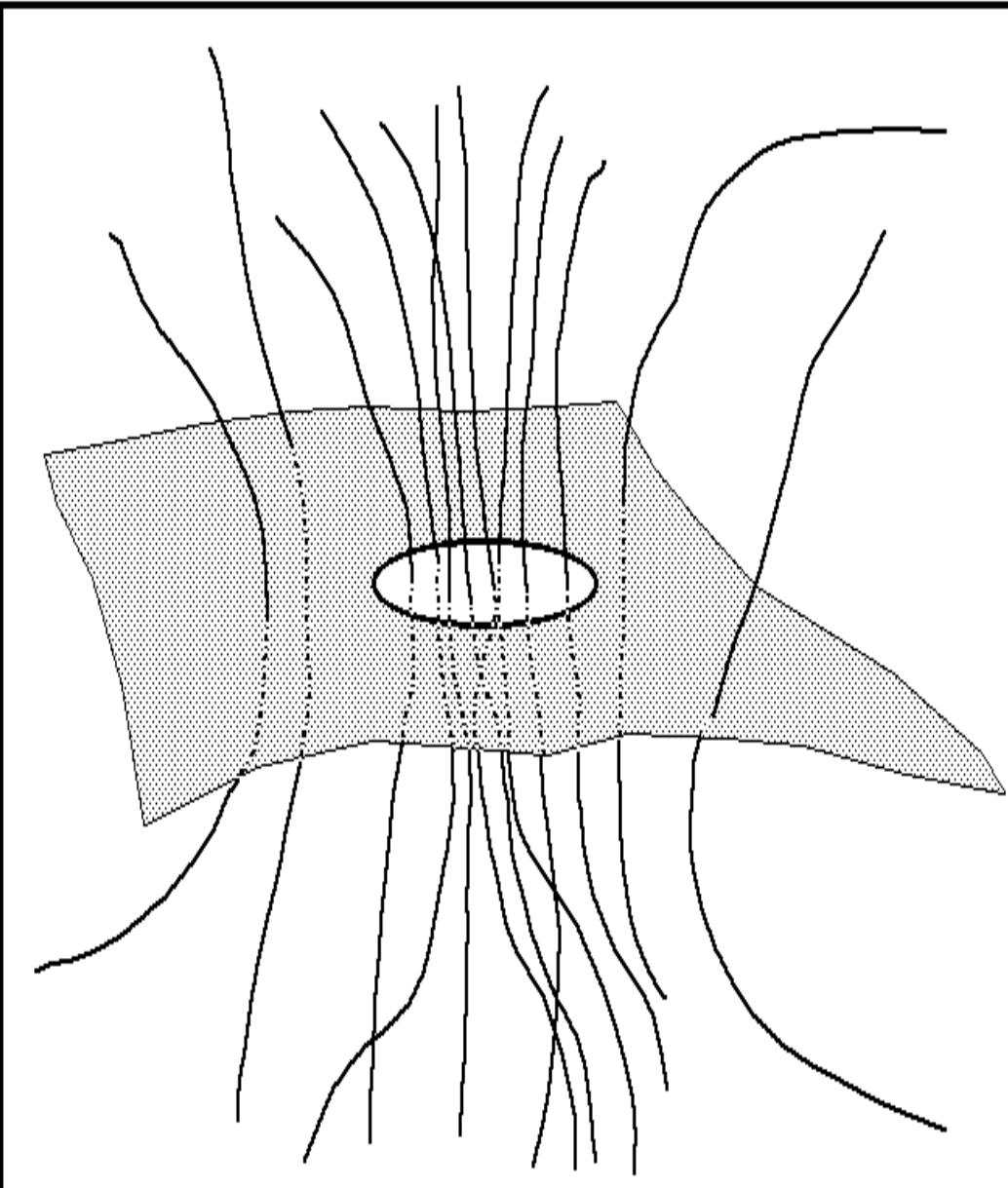
LONG-TERM PERFORMANCE GUIDE LINES*



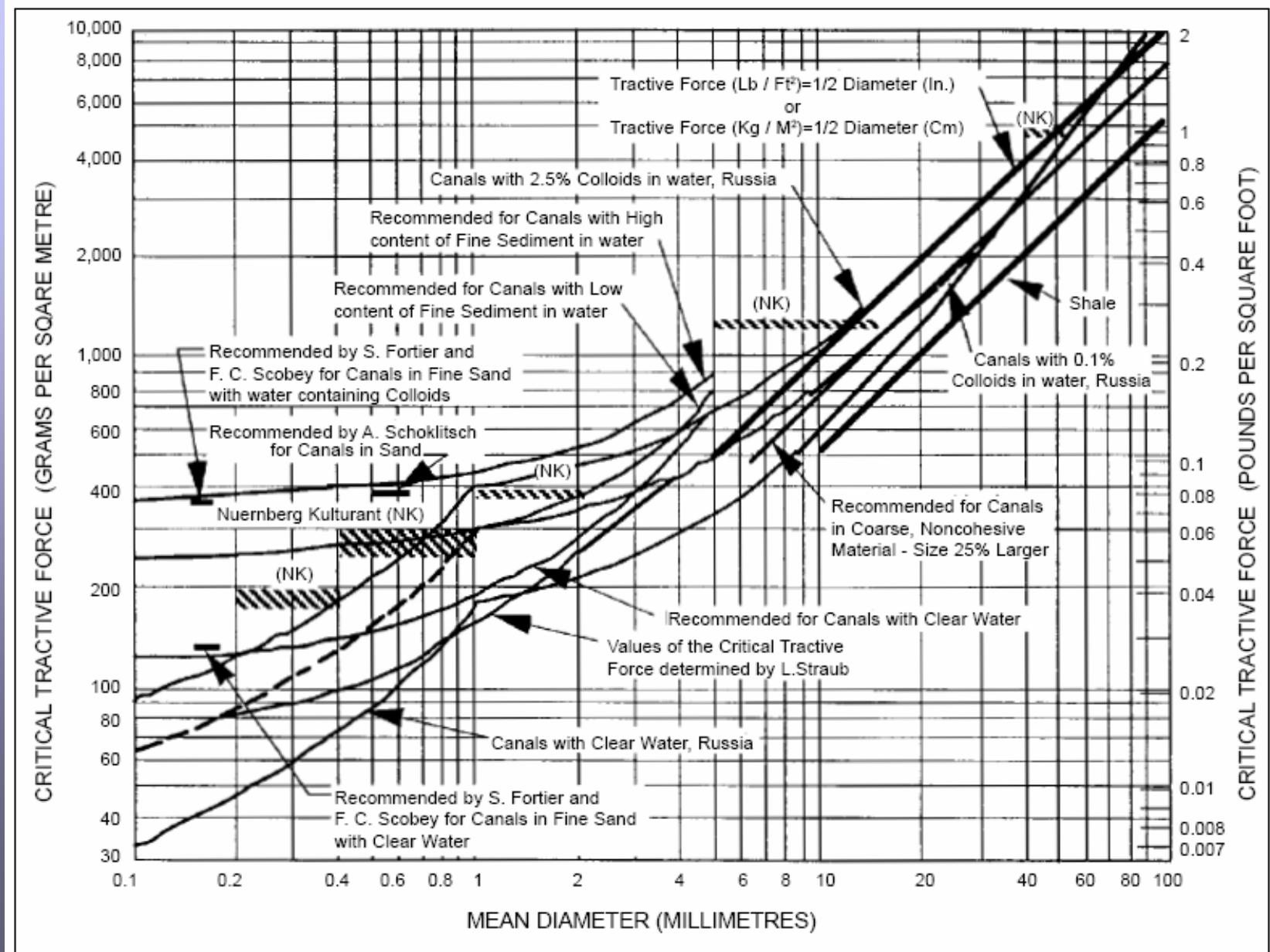
* Based upon long-term (50 hour) flow data.

** Includes erosion control blankets, fiber roving systems, hydraulic/straw mulches, etc.

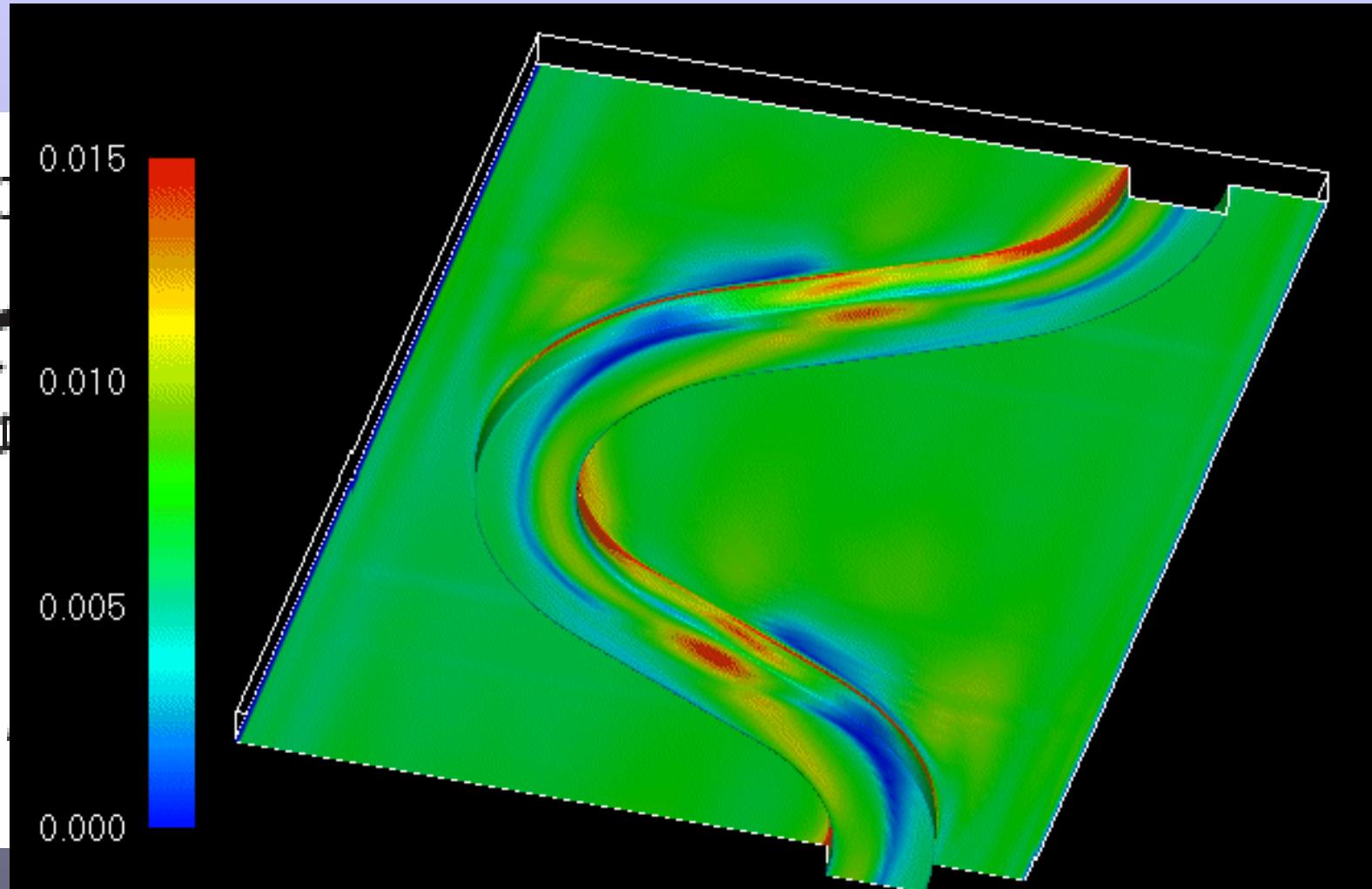
... ¿Y la velocidad?



... ¿Y la velocidad?



... ¿Y la velocidad?



Turbulent energy distribution on riverbed



¿Ríos o canales?

Río = canal natural

$$1 + 1 = 2$$

¿Ríos o canales?

Río = sistema fluvial





Visión SISTÉMICA

*Restoration
Aquatic Ecosystems*
Science, Technology

Committee on Restoration
Science, Technology
Water Science and
Commission on Geoscience
and Resources
National Research

ACHIEVING SUSTAINABLE FRESHWATER SYSTEMS

A WEB OF CONNECTIONS

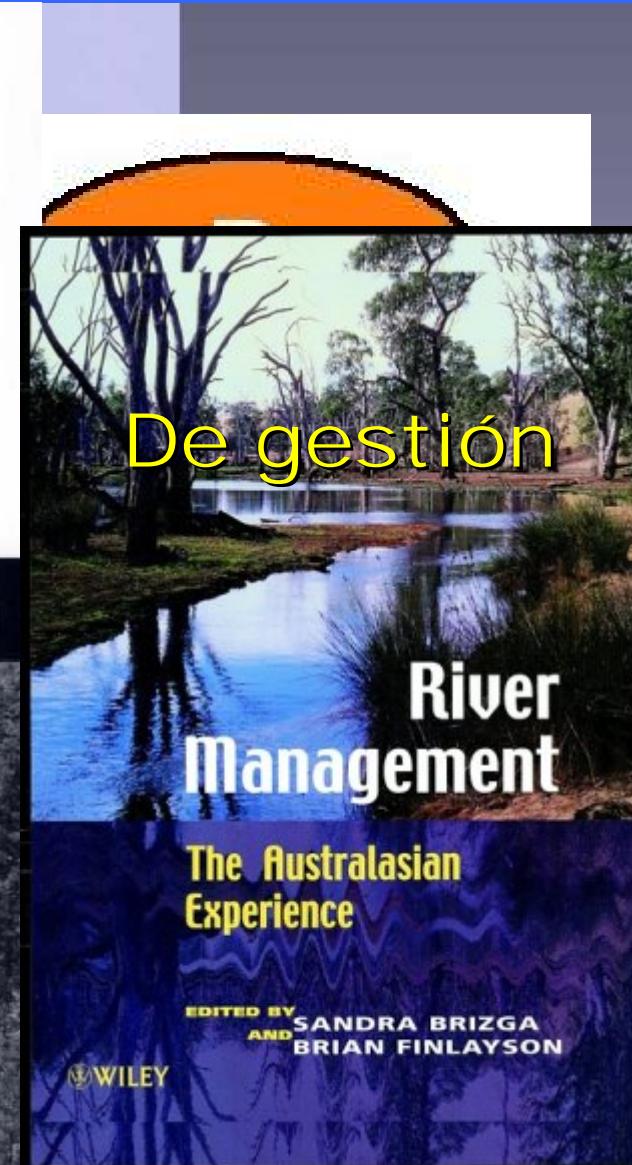
Ecosistémica

Transdisciplinar

Edited by

MARJORIE M. HOLLAND, ELIZABETH R. BLOOD,
and LAWRENCE R. SHAFFER

NATIONAL ACADEMY
Washington



Precisión

ESTADÍSTICOS

Analisis de datos

Realismo

PREDICTIVOS

Modelos físicos

Es necesario un margen de rectificación

Generalidades

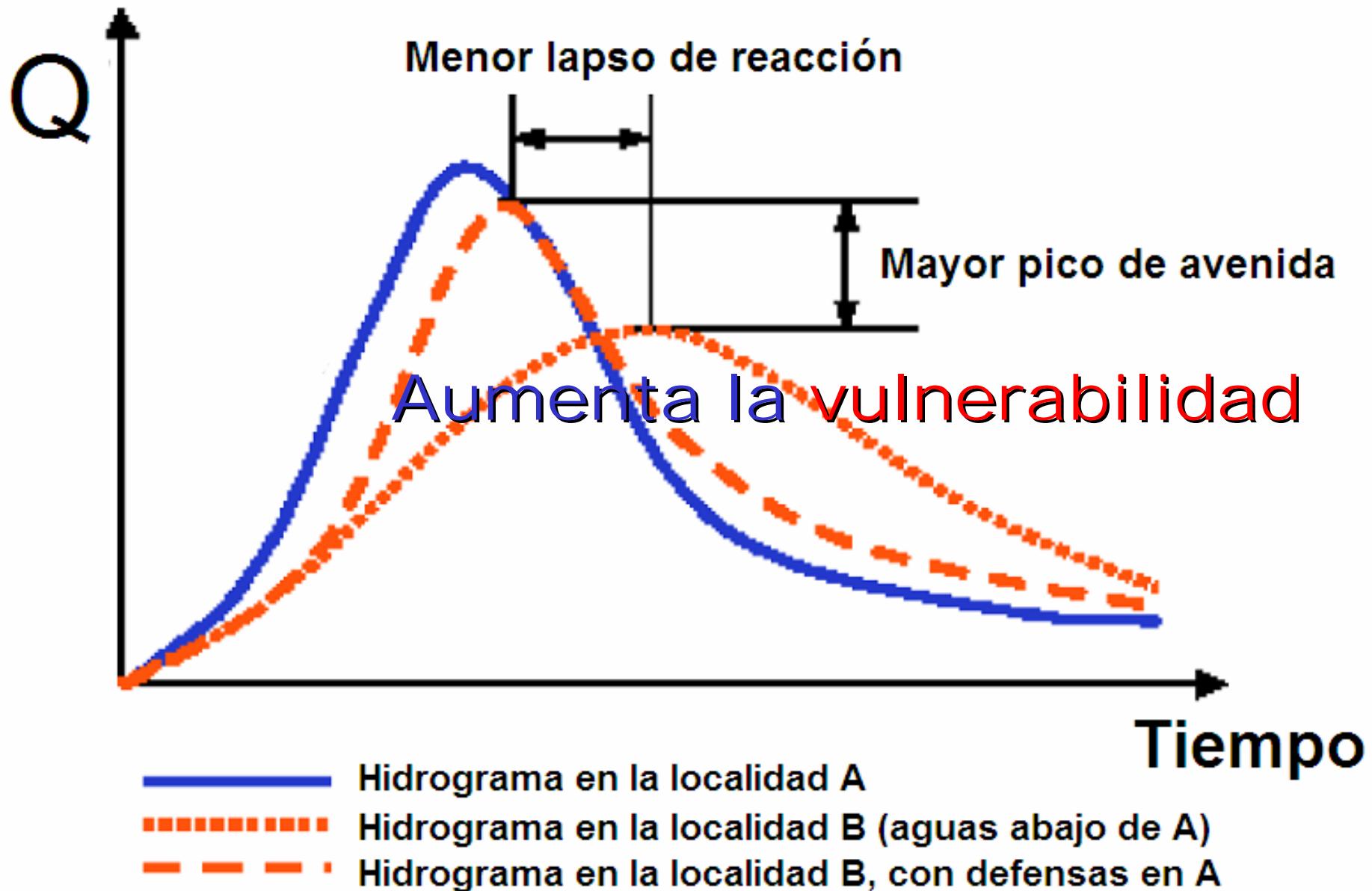
EXPLORATORIOS

Holismo

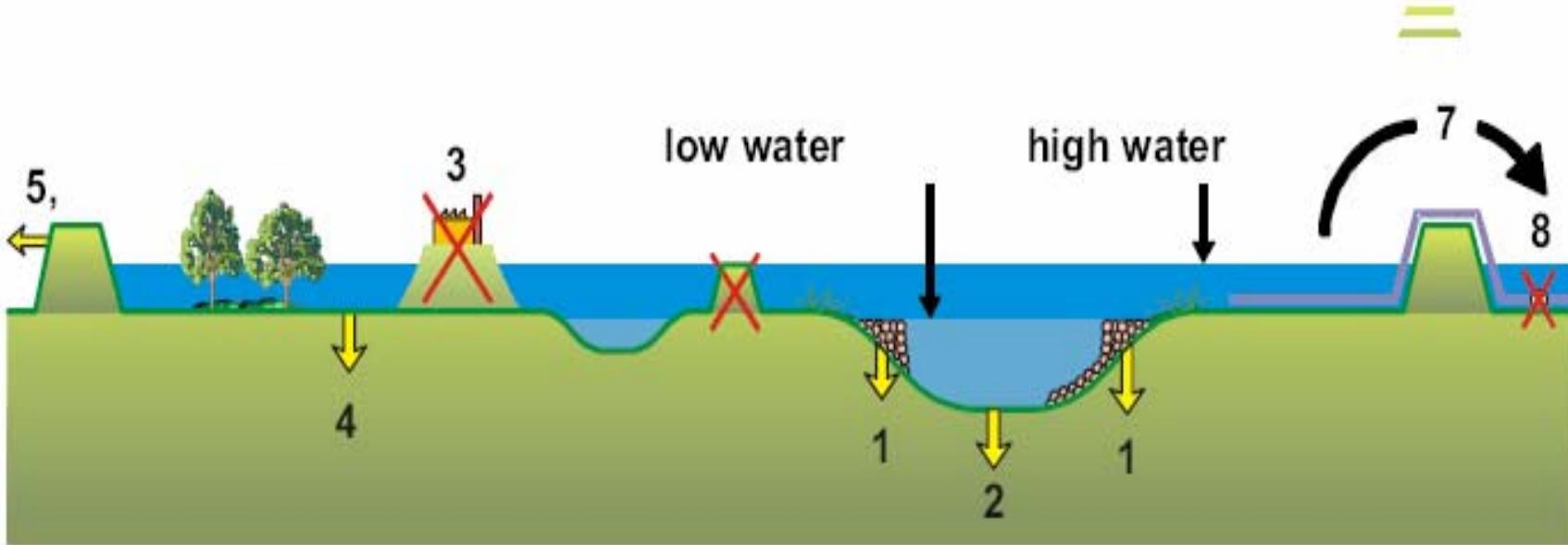
CUANTITATIVOS

CONOCIMIENTO

Los atractivos del río



Devolver espacio al río



- 1 - lowering of
- 2 - deepening low flow
- 3 - removing hydraulic
- 4 - lowering flood

- 5 - locally setting back
- 6 - setting back dikes on a large
- 7 - detention
- 8 - reduction lateral

various types of river improvement measures



El efecto demostración

	Great Lakes	Chesapeake Bay	Coastal Louisiana	Columbia River	Florida Everglades	San Francisco Bay-Delta	Upper Mississippi River
Geographical coverage (miles ²)	500,000	64,000	18,000	269,000	18,000	39,000	190,000
Jurisdictional coverage	8 states; 2 federal governments; 2 provinces	6 states; District of Columbia; 1 federal government	1 state; 1 federal government	7 states; 2 federal governments; 1 province	1 state, 1 federal government	1 state; 1 federal government	5 states; 1 federal government
Population	34 million	16 million	2 million	11 million	12 million	7 million	30 million
Lead federal agency	Environmental Protection Agency	Environmental Protection Agency	Army Corps of Engineers	Northwest Power and Conservation Council/ National Oceanic & Atmospheric Administration/ U.S. Fish & Wildlife Service	Army Corps of Engineers	Department of Interior	Army Corps of Engineers
Lead state agency	Multi-state	Multi-state	Louisiana Department of Natural Resources	Multi-state	South Florida Water Management District	California Resources Agency	Multi-state
Start date	n/a	1983	n/a	1980	1993	1995	1986
Finish date	n/a	Ongoing	2050	Ongoing	2038	2030	Ongoing
Estimated total cost	Billions	\$12 billion	\$14 billion	Billions	\$8 billion	\$8.5 billion	Billions

Comencemos por lo fácil

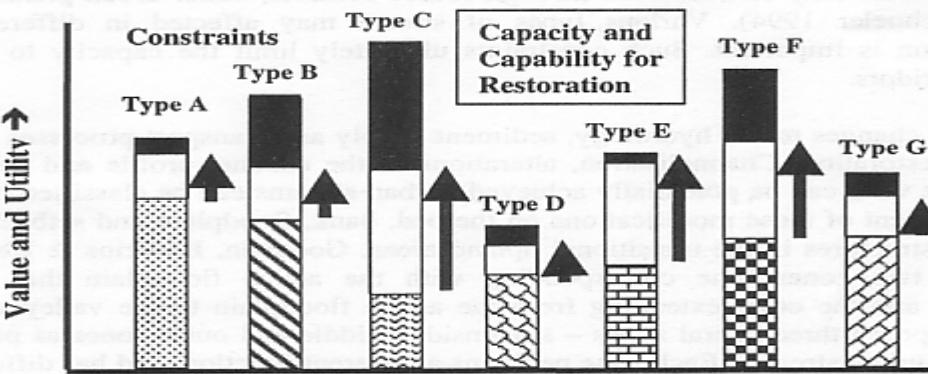
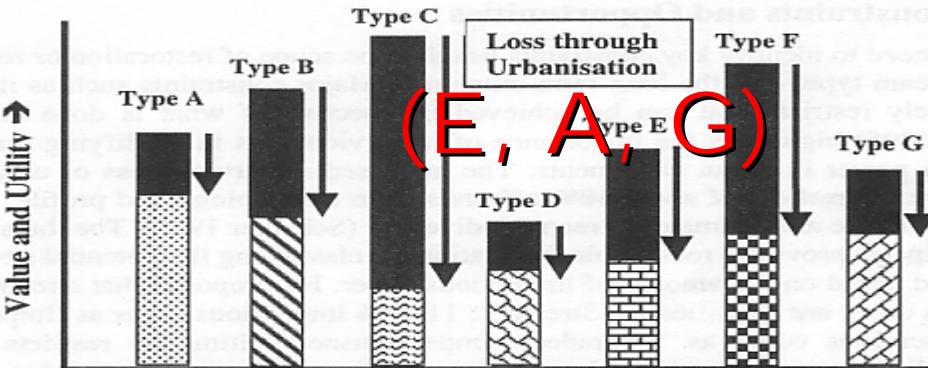
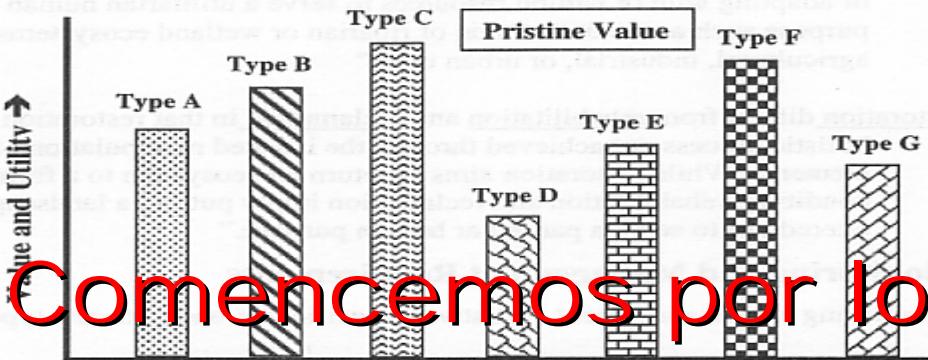
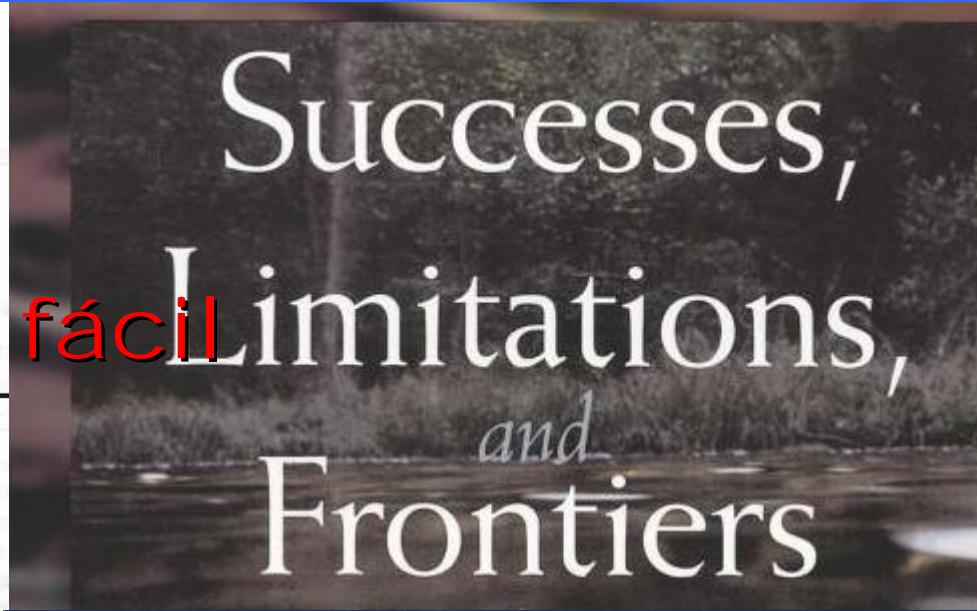
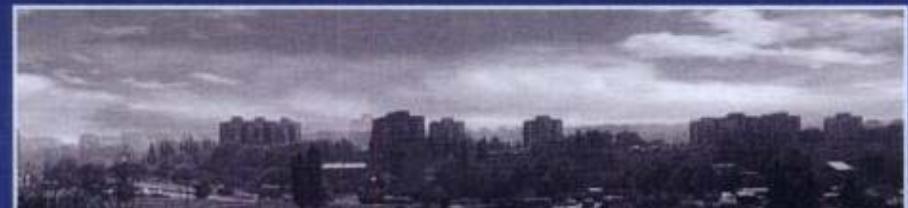


Figure 3. The effects of constraints in limiting the capacity and capability of various stream types for restoration.



RIVER QUALITY

Dynamics and Restoration



Factibilidad

Tabla 4.2. Cuantificación de los parámetros directores de las riberas de Andalucía

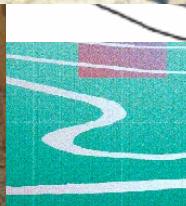
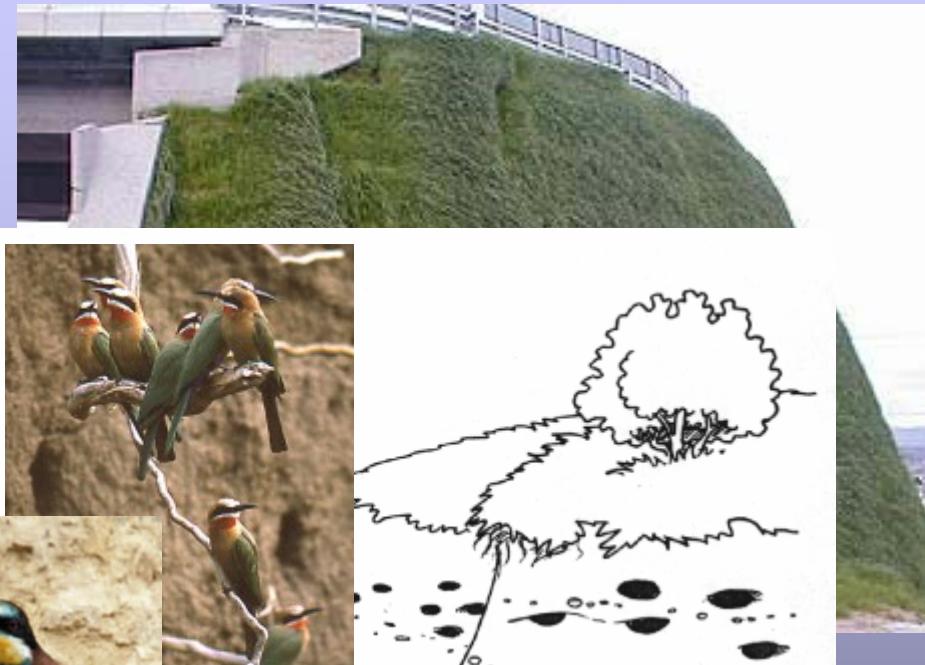
Id.	Descripción	Km	%
R1	Restauración fácil	4.366	19
R2	Restauración compleja	3.535	15
R3	Restauración no recomendable	3.464	15
<i>Total Restauración</i>		11.365	49
C	Conservación	11.833	51
<i>Total Andalucía</i>		23.249	100

Primero, conservar

... ¿Se erosiona la vegetación?



Los cortados también existen





Los Cinco Ciclos

H_2O

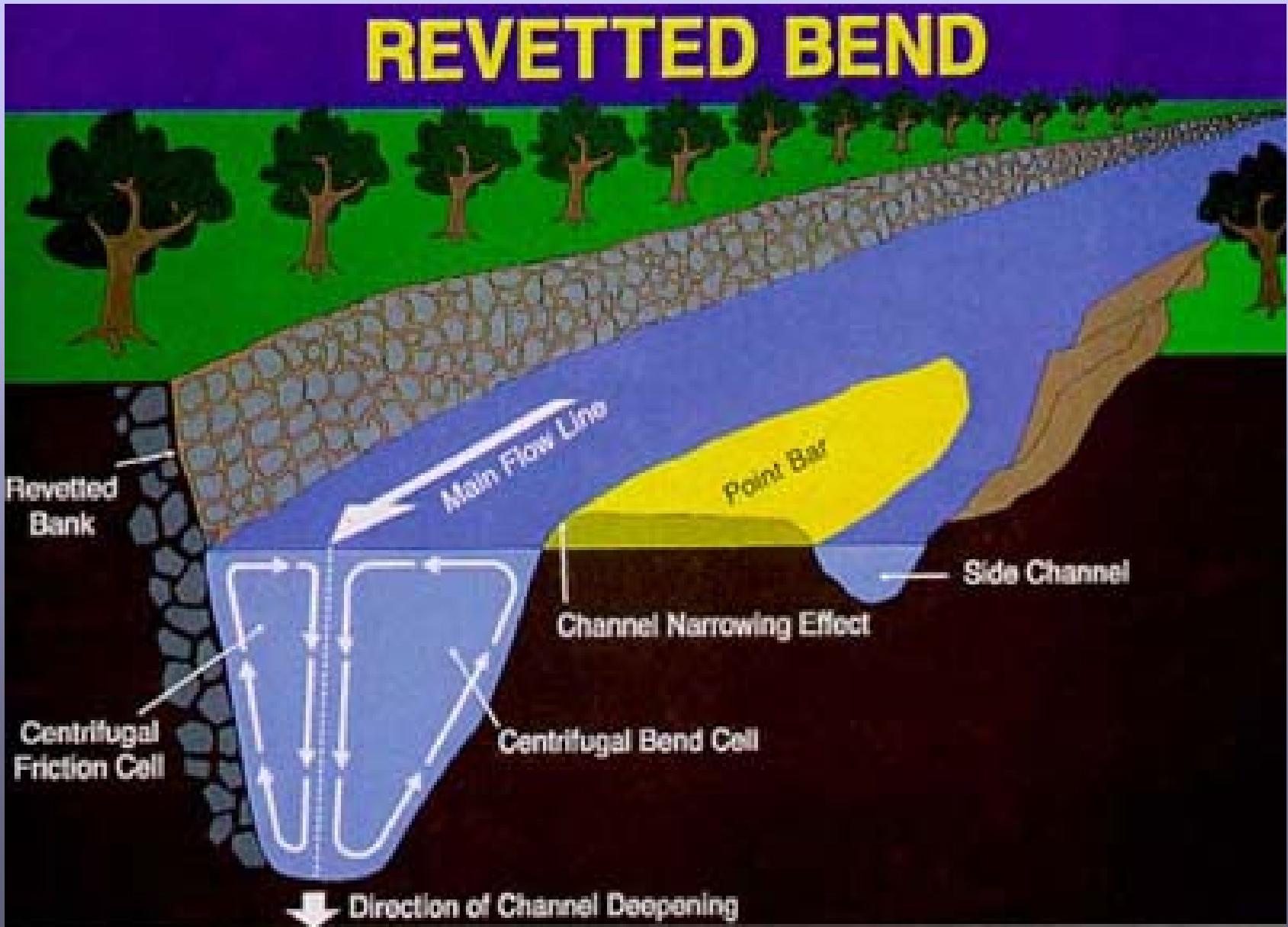
SÓLIDOS

NUTRIENTES

VIDA

EMOCIONES

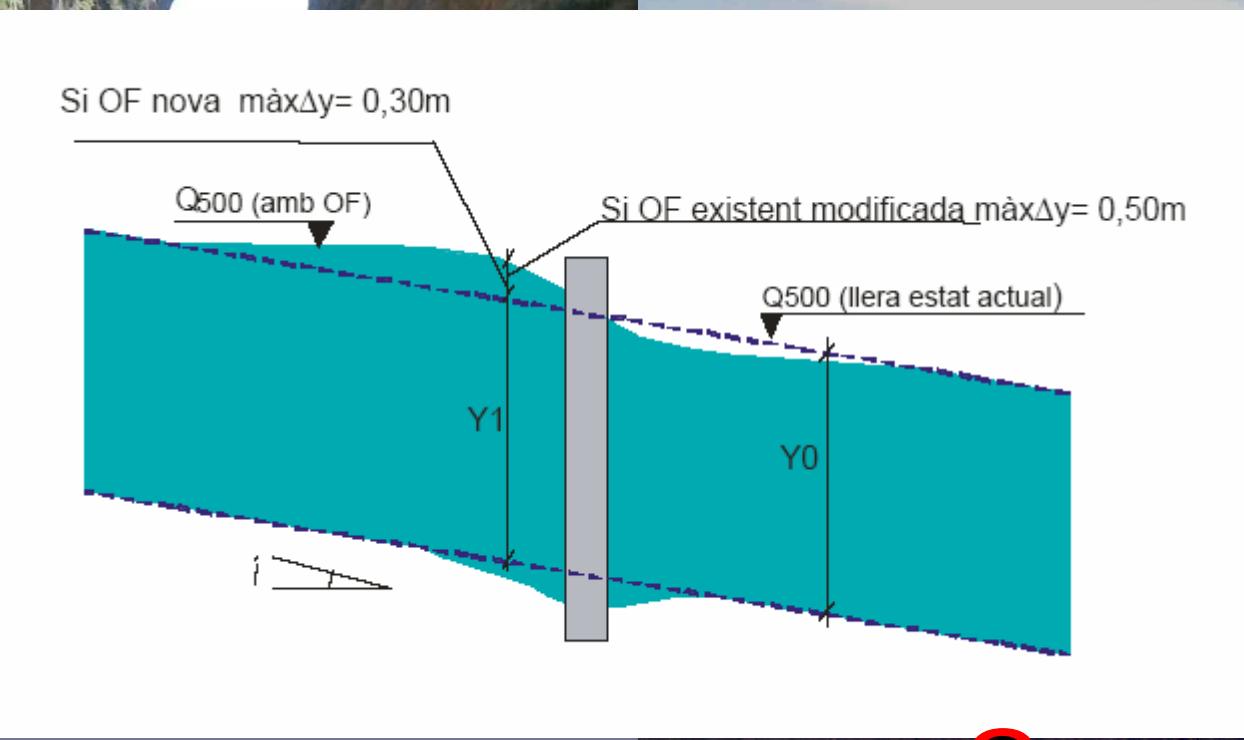
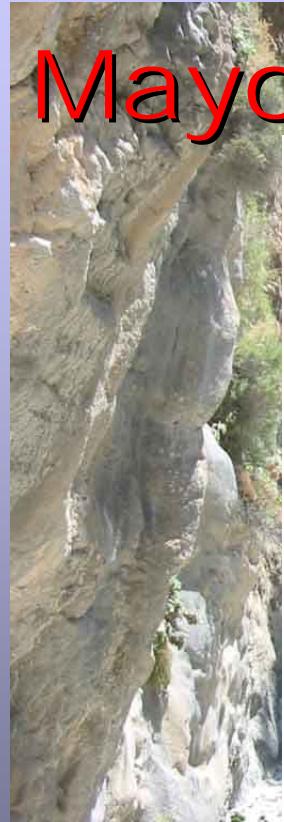
Grados de libertad



Grados de libertad

Mayor diámetro

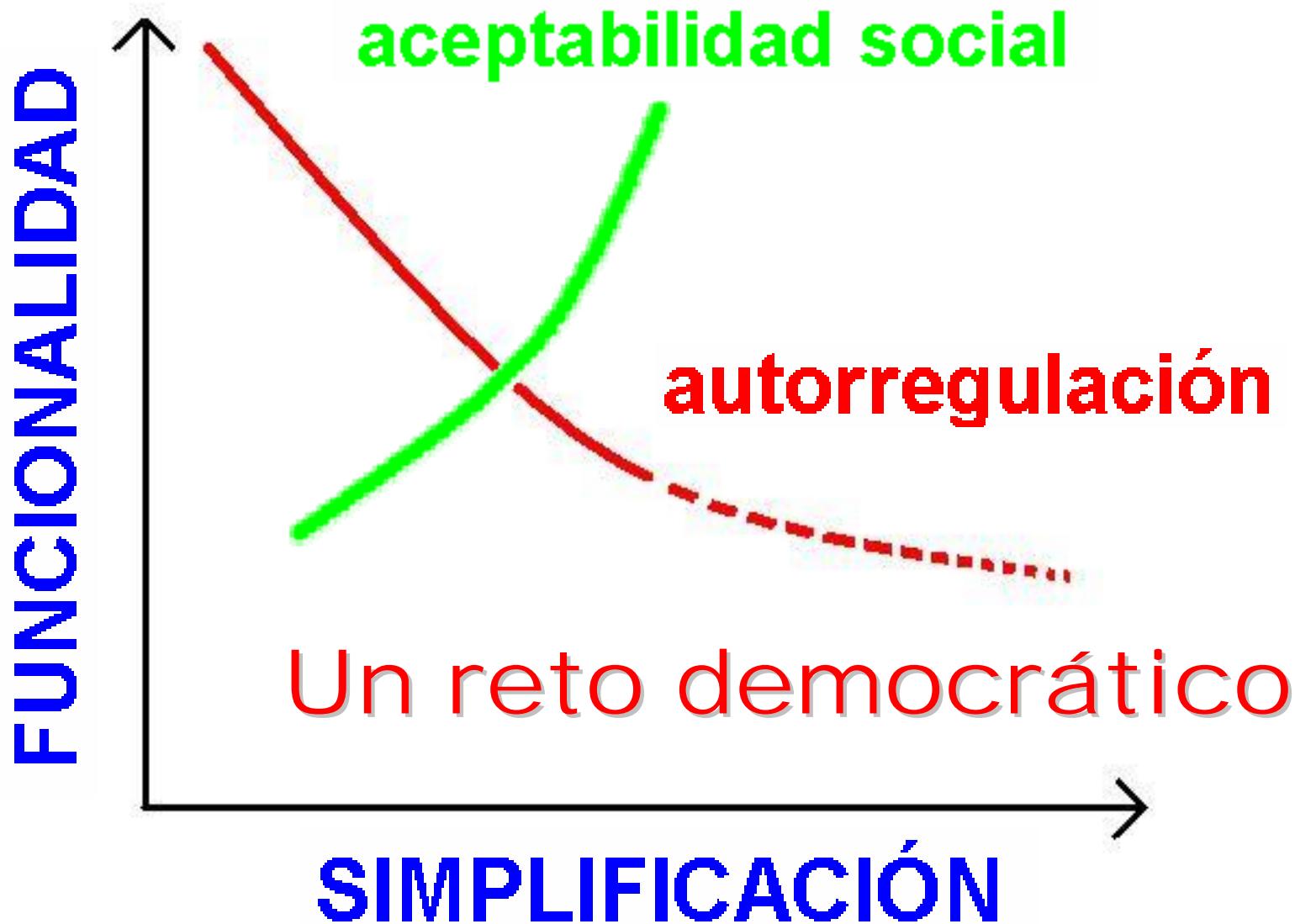
Masas de edad



Vegetación $\times 3$
Caudal sólido $\times 6$



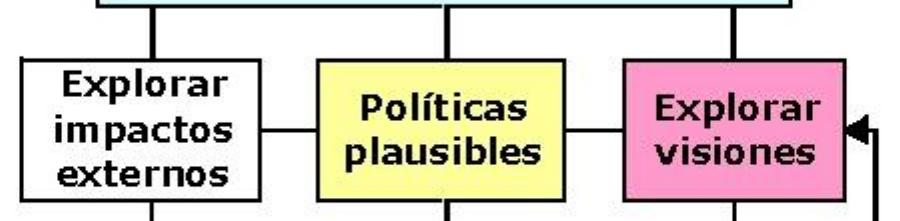
¿Qué Ríos Queremos?



¿Qué Ríos Queremos?

PASO 1

Descripción del sistema
Procesos clave, ecosistemas, estructuras y actores

PASO 2**PASO 3**

Análisis de resiliencia

PASO 4

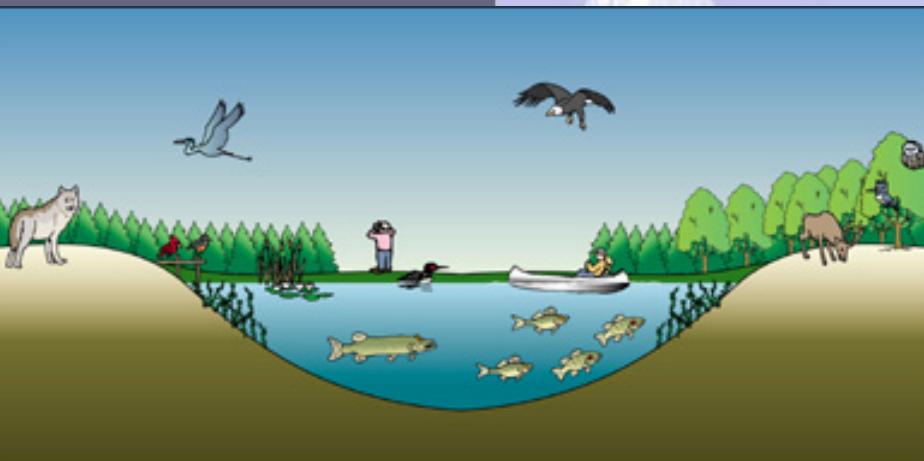
Evaluación de agentes

PASO 5

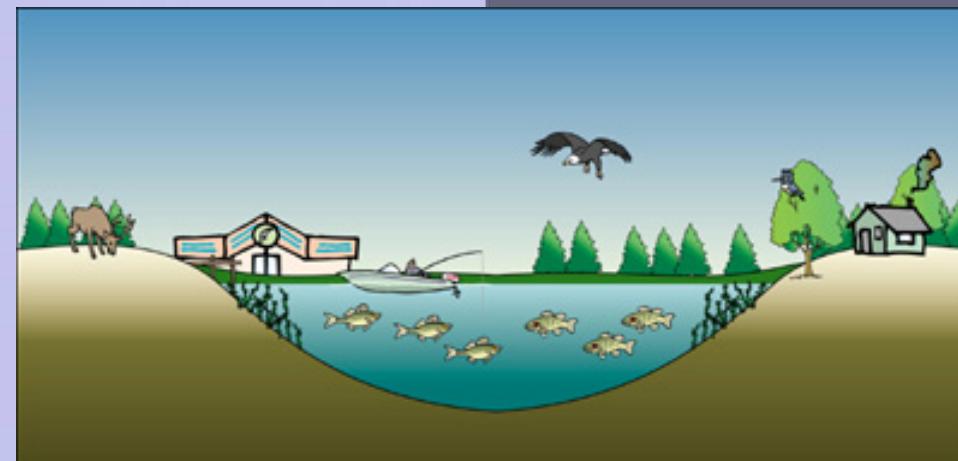
ACCIONES

Mejores métodos de integración

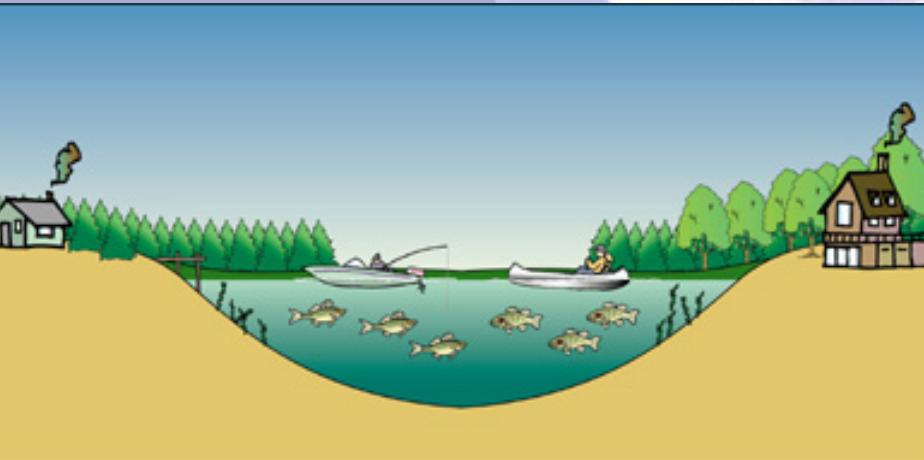
¿Qué Ríos Queremos?



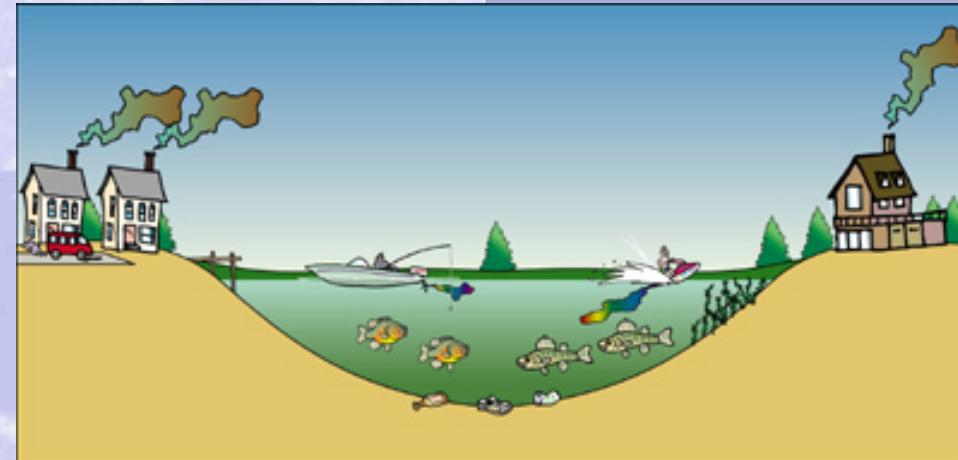
¿Salvajes?



¿Ajardinados?



¿Explotados?



¿Colonizados?

De cómo nos hacemos pobres

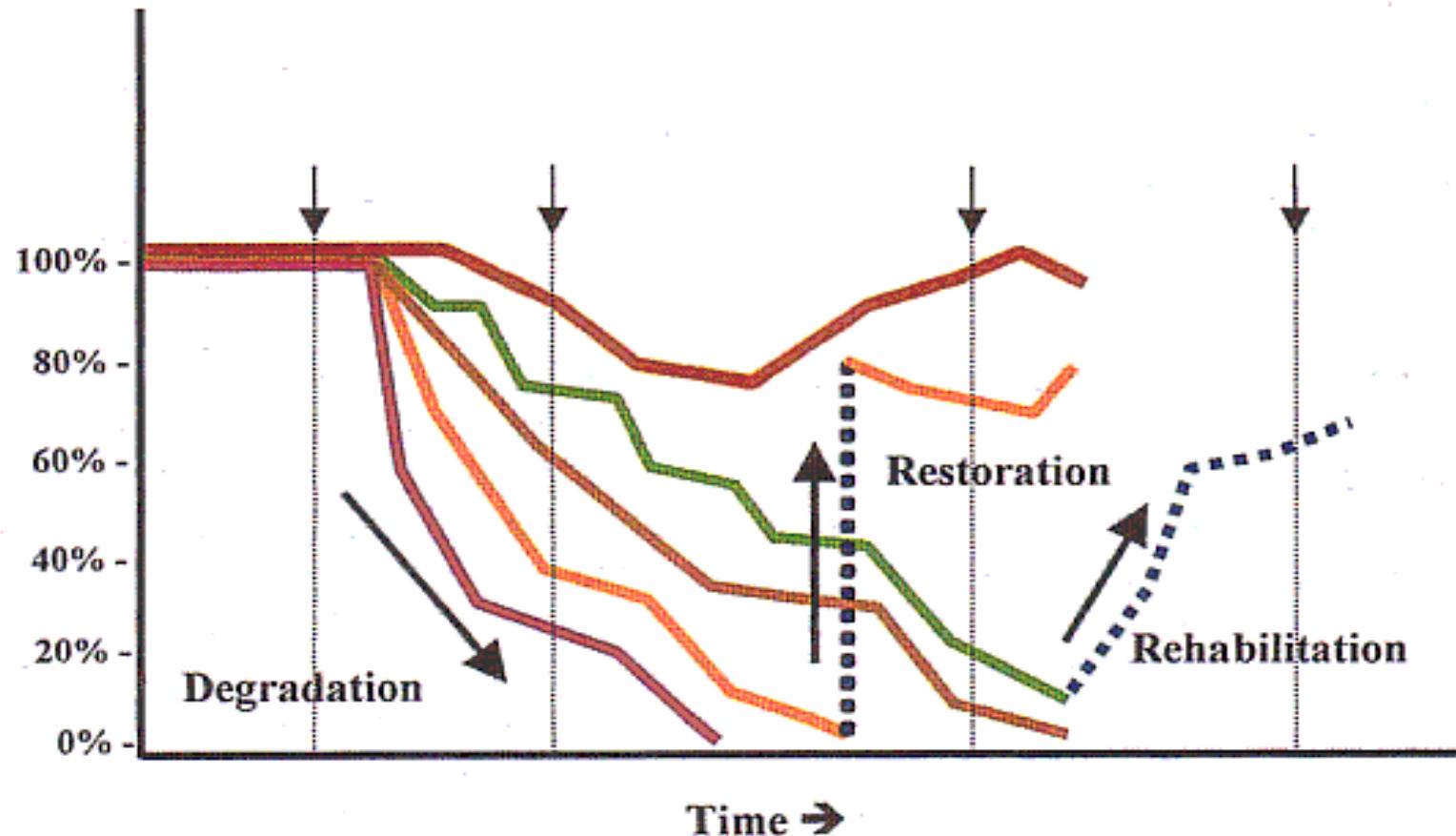
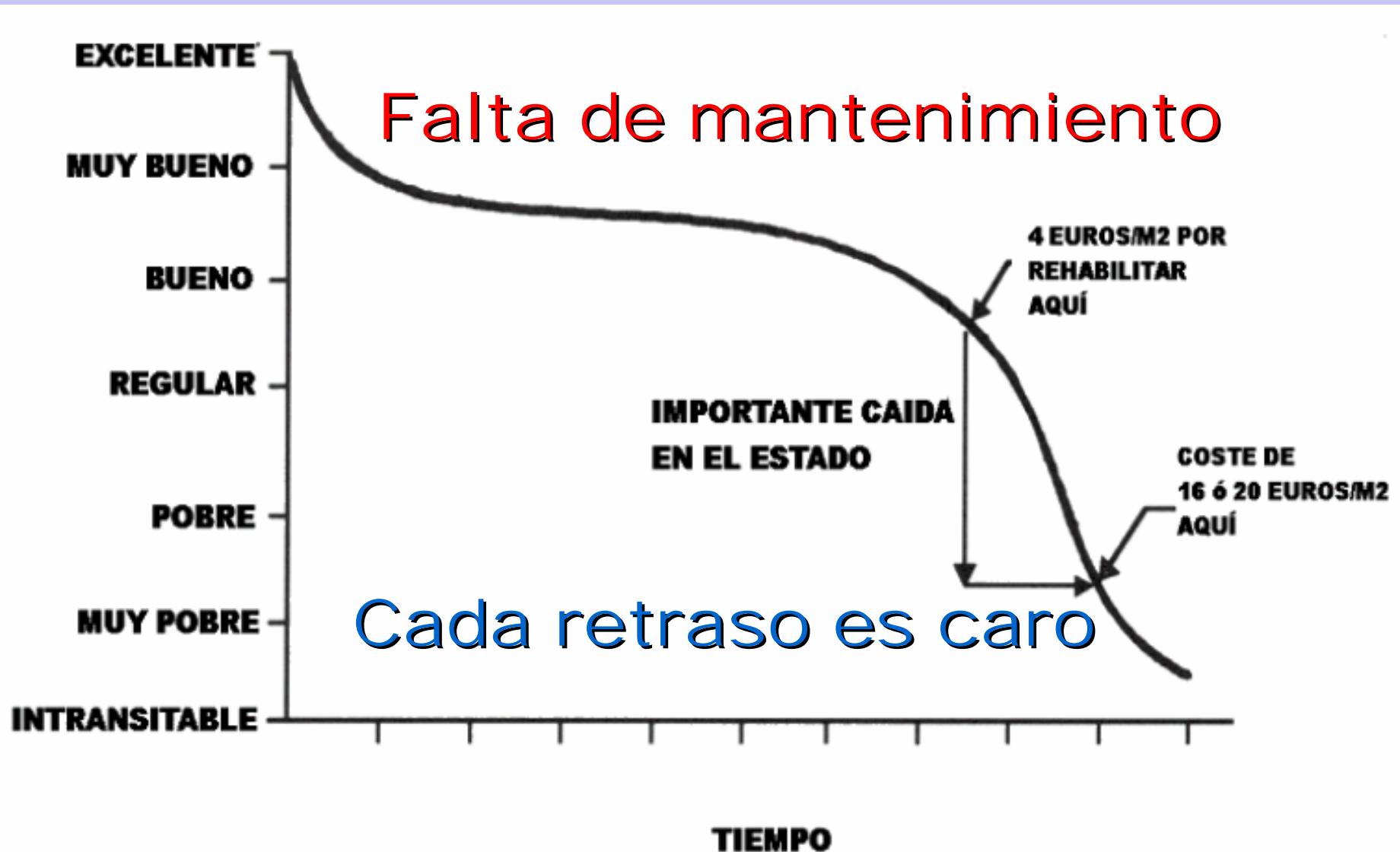
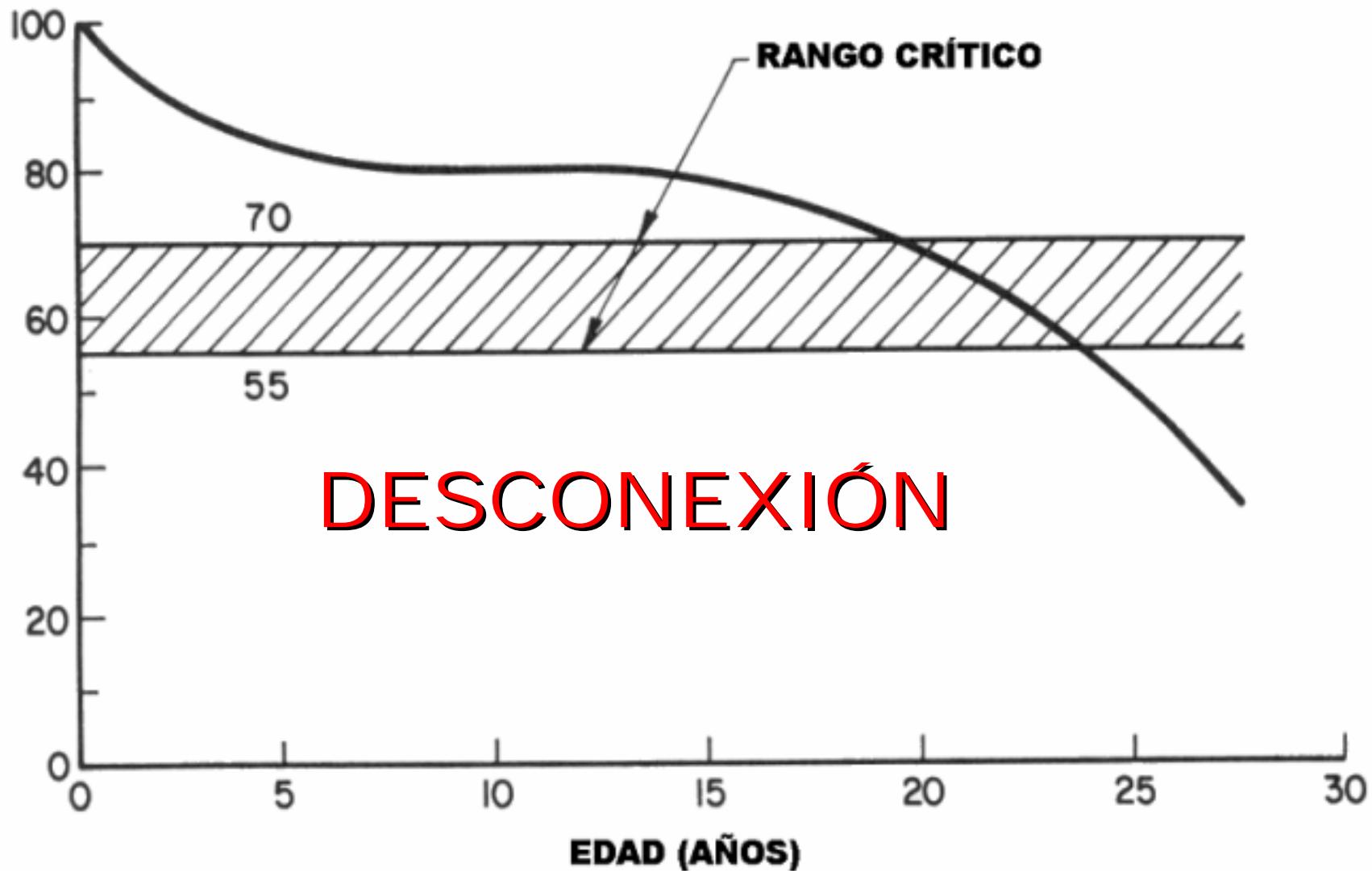


Figure 1. Time series changes in relative value and utility of streams, channels, riparian zones and floodplain/valley flats with degradation, rehabilitation and restoration.

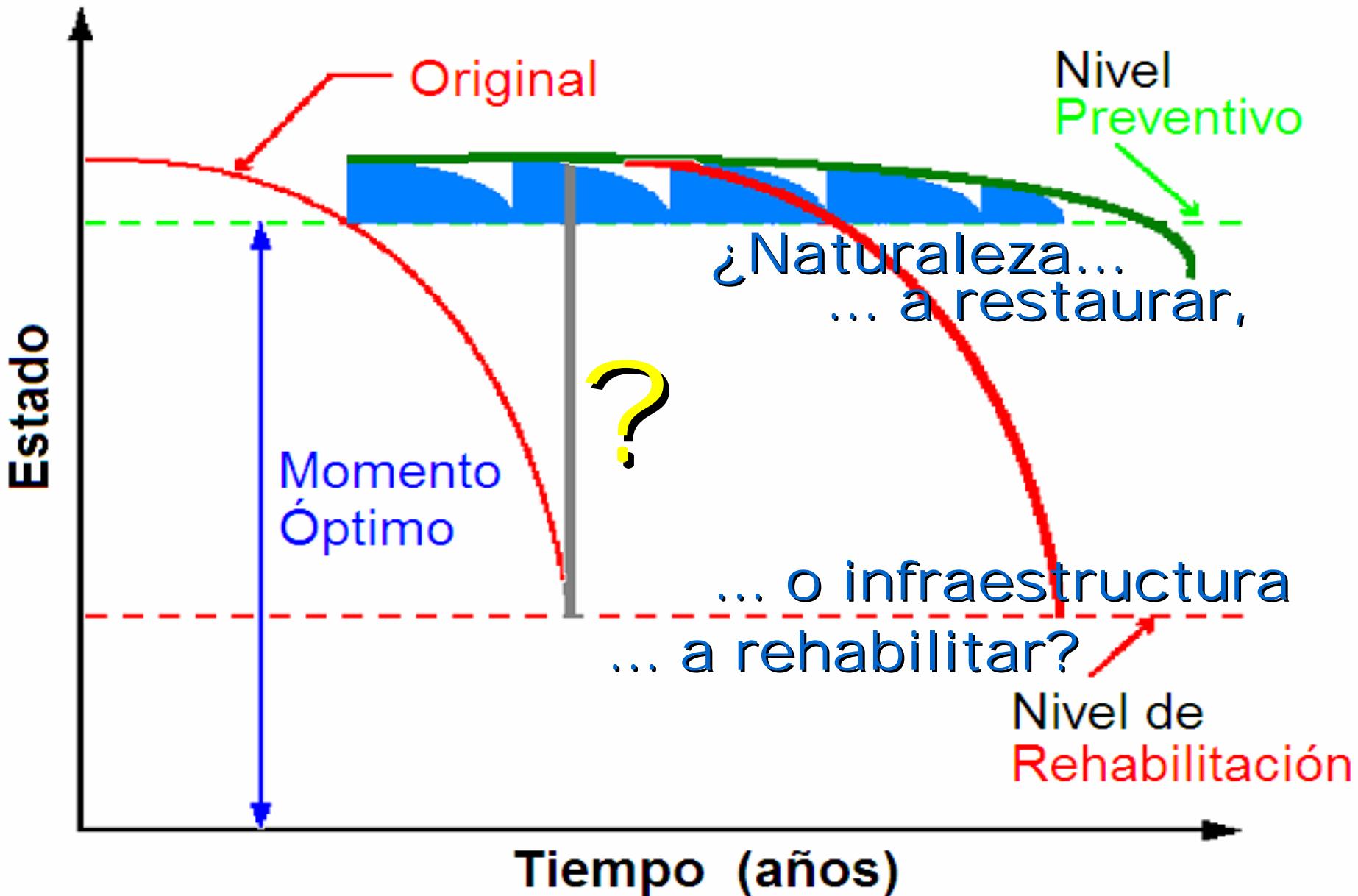
La urgencia de la restauración

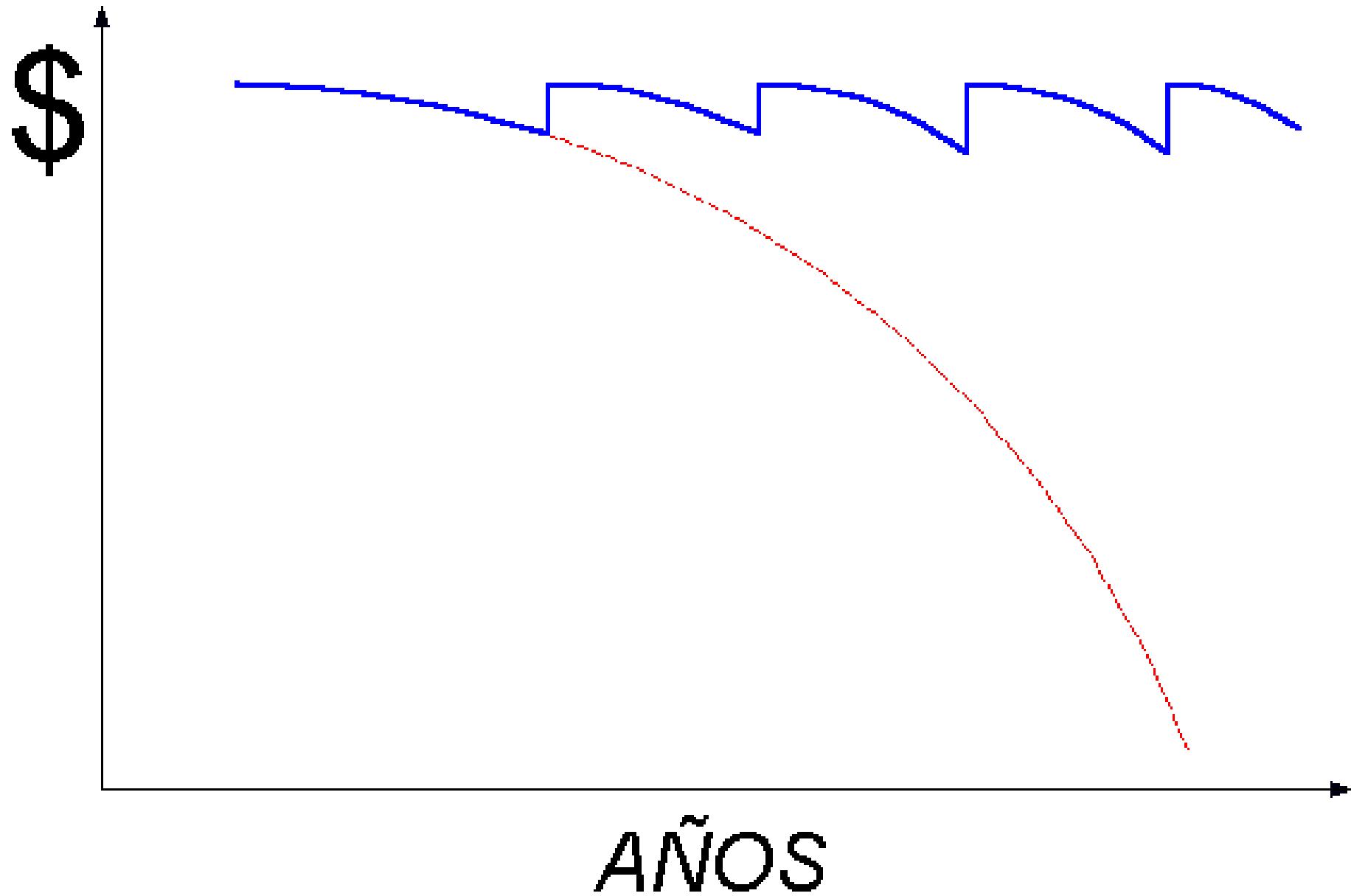


Entre estrechos márgenes



Dos formas de entender el río





Lo que se inaugura



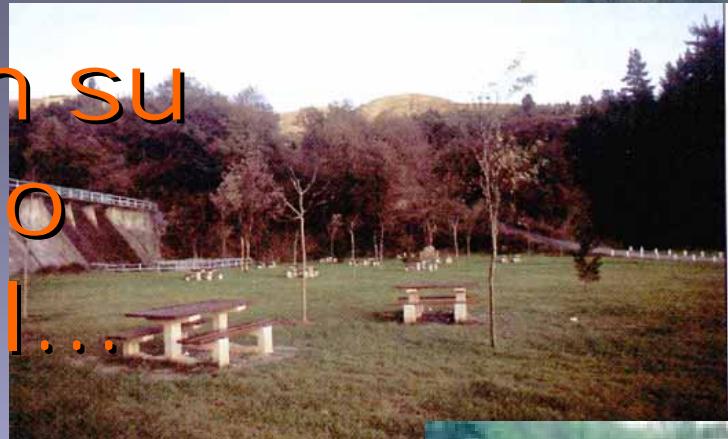
De proyectos a PROCESOS



As the nautilus shape suggests, ecosystem restoration is an iterative process. From the first call to action through plans, action, and reporting out, tenacity and commitment is required to "just keep going" through the decades and billions it will take to get the job done. Through the use of adaptive management, groups will reconvene and revise the plan after ecosystem outcomes are evaluated, and then do it again perhaps years later. Hopefully each reiteration will involve less alteration to the plan and provide evidence that you have moved closer to a restored ecosystem that is healthy, fully functioning, and alive with fish and wildlife.

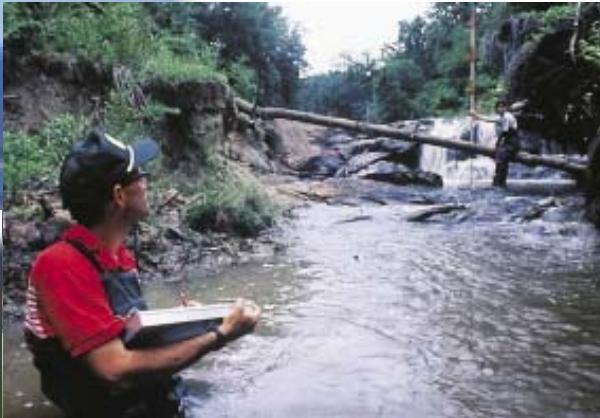
Tramificación por objetivos

Según su
estado
inicial...

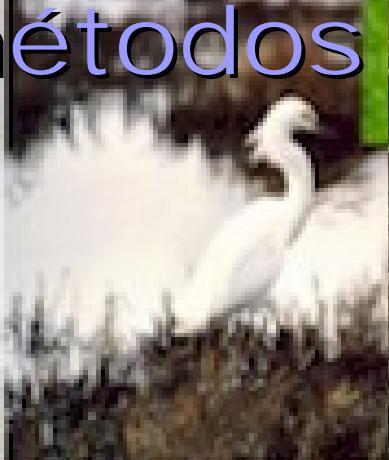


Nuestros Laboratorios

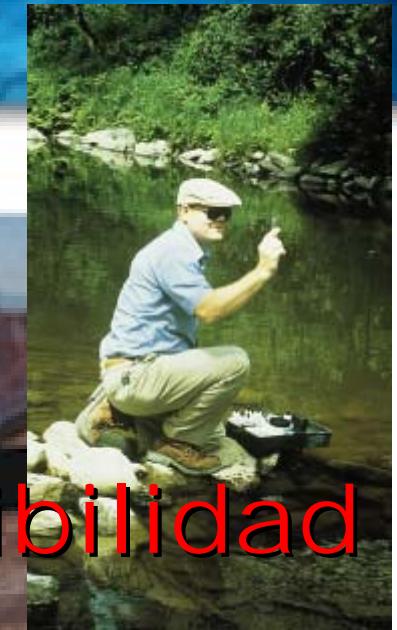
Seguimiento



Mejora de métodos



Reversibilidad



Nuevos y viejos modelos

Procesos

Gestión y R. pasiva

De mejor a peor

Causas

Integración

Todos ganan

Conjunto fluvial

Tiene que moverse

Conexiones

Proyectos

Restauración activa

De peor a mejor

Síntomas

Descoordinación

Revancha

Lecho

Si se mueve, fallo

Desconexión

La prueba del nueve

Estructura

Continuidad

Dimensiones

Vegetación

Funcionamiento

Vigor vegetativo

Estabilidad

Conexiones

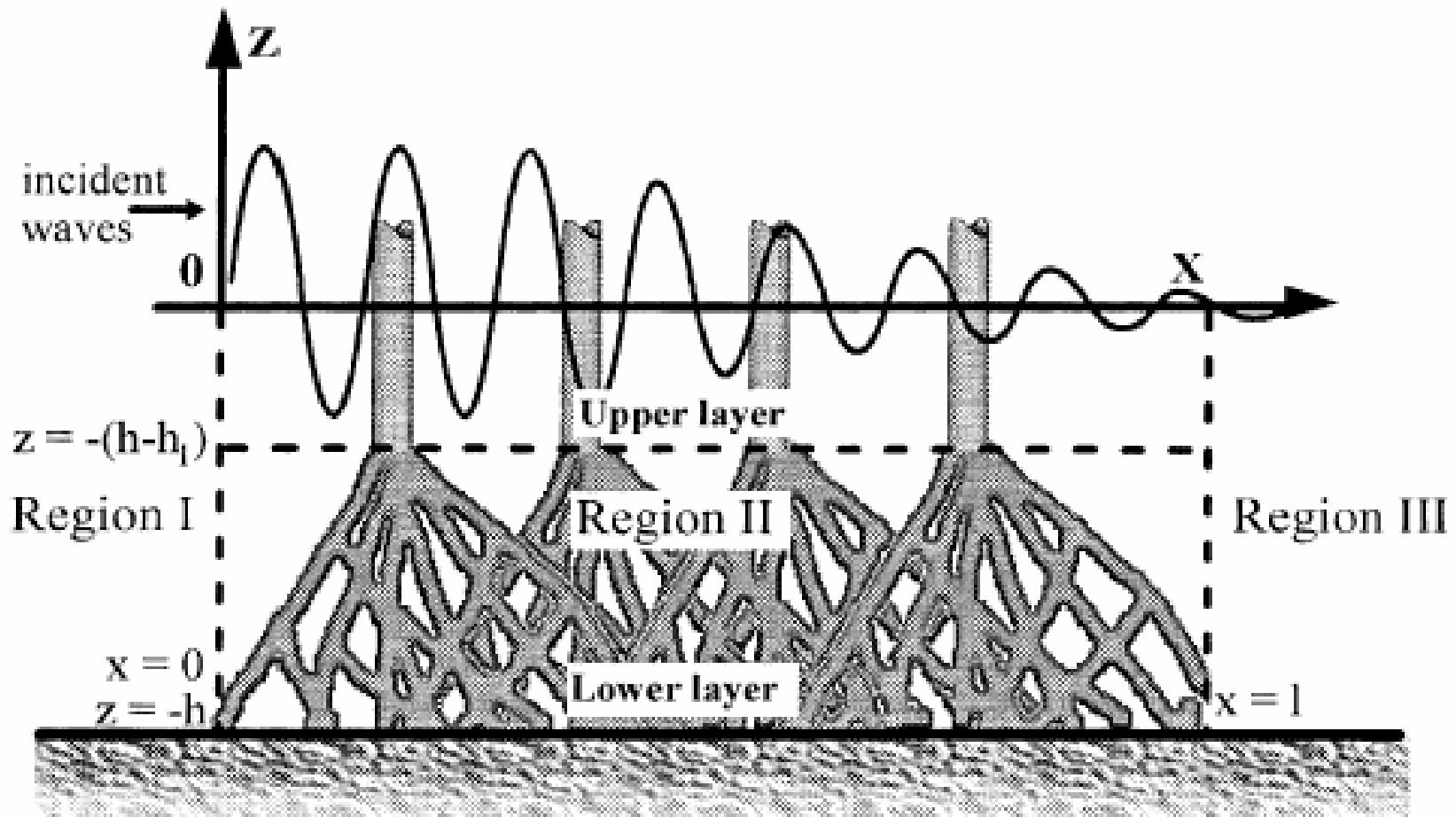


MUCHAS GRACIAS

g-bastida@usa.net

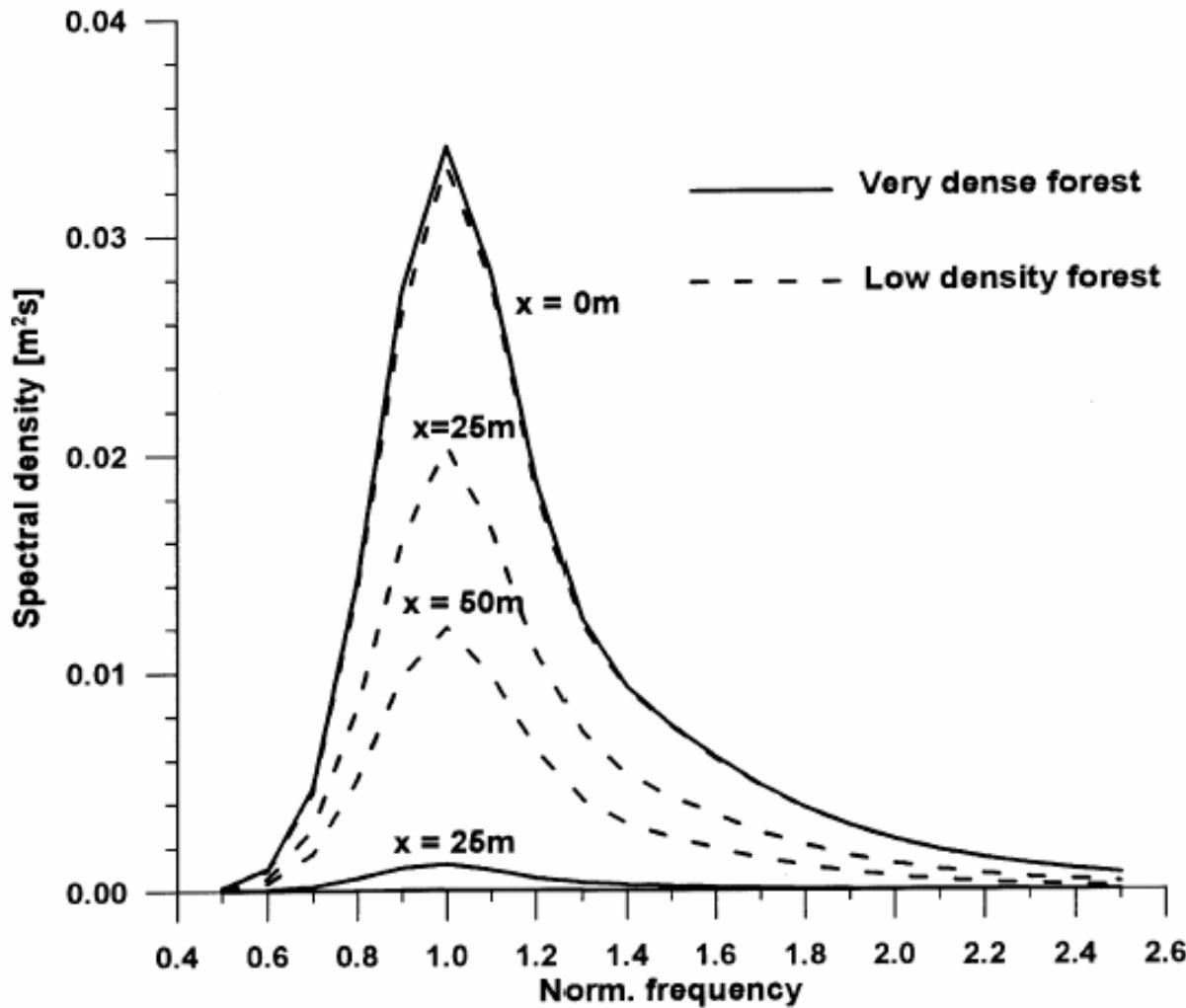
Manglares y tsunami

S.R. Massel et al. / Fluid Dynamics Research 24 (1999) 219–249



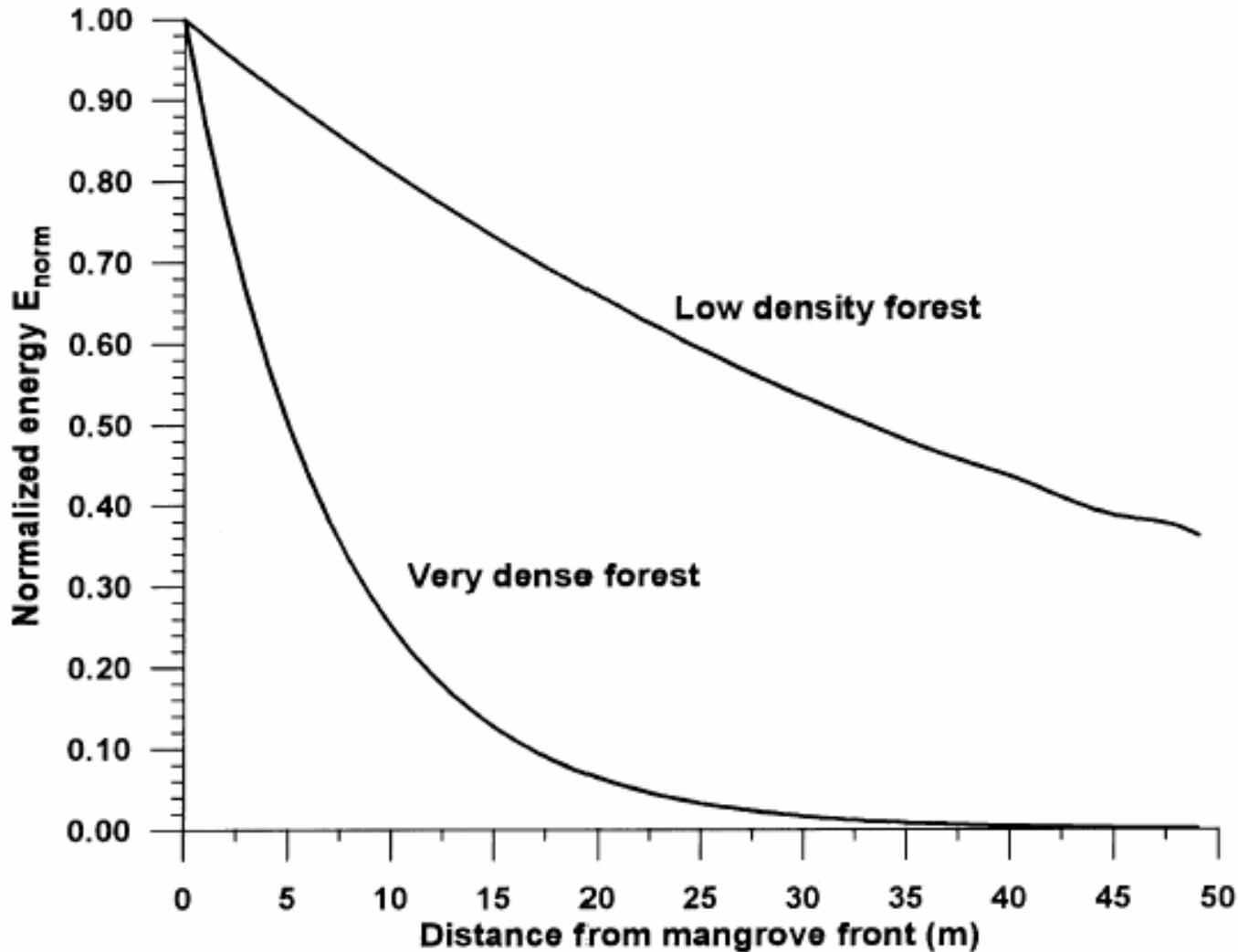
Manglares y tsunami

S.R. Massel et al. / Fluid Dynamics Research 24 (1999) 219–249

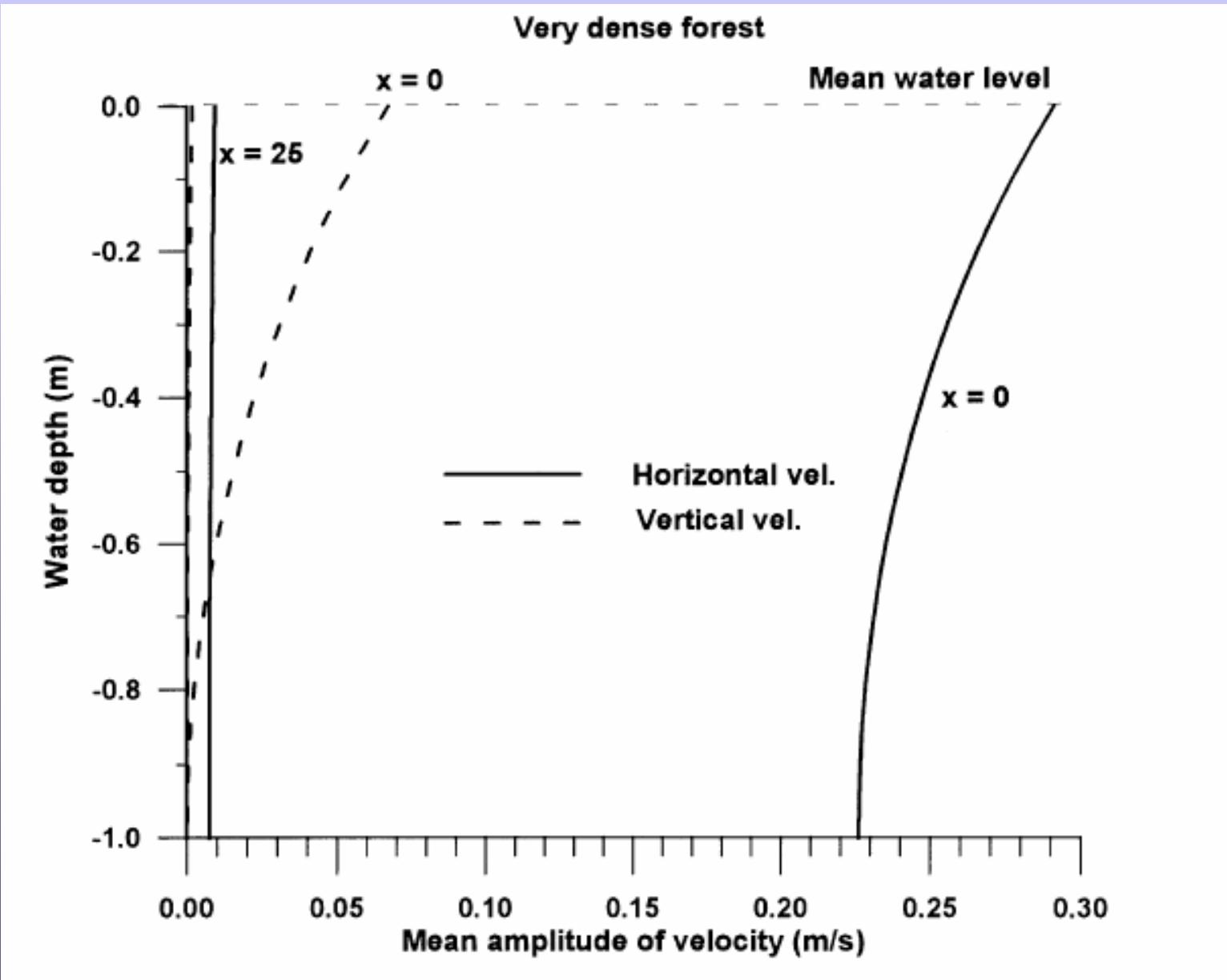


Manglares y tsunami

S.R. Massel et al. / Fluid Dynamics Research 24 (1999) 219–249



Manglares y tsunami



Manglares y tsunami

S.R. Massel et al. / Fluid Dynamics Research 24 (1999) 219–249

